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WHAT IS CLAIMED IS:

1. A human interleukin-3 mutant polypeptide

Formula I:

5 Ala Pro Met Thr Gln Thr Thr Ser Leu Lys Thr Ser Trp Val Asn
 1 5 10 15

 Cys Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
 20 25 30
 10 Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Asn Xaa Xaa Xaa Xaa Xaa Xaa
 35 40 45

 Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
 15 50 55 60

 Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
 65 70 75

 20 Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
 80 85 90

 Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
 95 100 105
 25 Xaa Phe Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
 110 115 120

 Xaa Xaa Xaa Gln Gln Thr Thr Leu Ser Leu Ala Ile Phe [SEQ ID
 30 125 130

NO:15]

wherein Xaa at position 17 is Ser, Lys, Gly, Asp, Met, Gln, or

35 Arg;

Xaa at position 18 is Asn, His, Leu, Ile, Phe, Arg, or Gln;

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Xaa at position 19 is Met, Phe, Ile, Arg, Gly, Ala, or Cys;
Xaa at position 20 is Ile, Cys, Gln, Glu, Arg, Pro, or Ala;
Xaa at position 21 is Asp, Phe, Lys, Arg, Ala, Gly, Glu, Gln,
Asn, Thr, Ser or
5 Val;
Xaa at position 22 is Glu, Trp, Pro, Ser, Ala, His, Asp, Asn,
Gln, Leu, Val or
Gly;
Xaa at position 23 is Ile, Val, Ala, Leu, Gly, Trp, Lys, Phe,
10 Leu, Ser, or Arg;
Xaa at position 24 is Ile, Gly, Val, Arg, Ser, Phe, or Leu;
Xaa at position 25 is Thr, His, Gly, Gln, Arg, Pro, or Ala;
Xaa at position 26 is His, Thr, Phe, Gly, Arg, Ala, or Trp;
Xaa at position 27 is Leu, Gly, Arg, Thr, Ser, or Ala;
15 Xaa at position 28 is Lys, Arg, Leu, Gln, Gly, Pro, Val or Trp;
Xaa at position 29 is Gln, Asn, Leu, Pro, Arg, or Val;
Xaa at position 30 is Pro, His, Thr, Gly, Asp, Gln, Ser, Leu, or
Lys;
Xaa at position 31 is Pro, Asp, Gly, Ala, Arg, Leu, or Gln;
20 Xaa at position 32 is Leu, Val, Arg, Gln, Asn, Gly, Ala, or Glu;
Xaa at position 33 is Pro, Leu, Gln, Ala, Thr, or Glu;
Xaa at position 34 is Leu, Val, Gly, Ser, Lys, Glu, Gln, Thr,
Arg, Ala, Phe,
Ile or Met;
25 Xaa at position 35 is Leu, Ala, Gly, Asn, Pro, Gln, or Val;
Xaa at position 36 is Asp, Leu, or Val;
Xaa at position 37 is Phe, Ser, Pro, Trp, or Ile;
Xaa at position 38 is Asn, or Ala;
Xaa at position 40 is Leu, Trp, or Arg;
30 Xaa at position 41 is Asn, Cys, Arg, Leu, His, Met, or Pro;
Xaa at position 42 is Gly, Asp, Ser, Cys, Asn, Lys, Thr, Leu,
Val, Glu, Phe,
Tyr, Ile, Met or Ala;
Xaa at position 43 is Glu, Asn, Tyr, Leu, Phe, Asp, Ala, Cys,
35 Gln, Arg, Thr,
Gly or Ser;

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- Xaa at position 44 is Asp, Ser, Leu, Arg, Lys, Thr, Met, Trp,
Glu, Asn, Gln,
Ala or Pro;
- Xaa at position 45 is Gln, Pro, Phe, Val, Met, Leu, Thr, Lys,
5 Trp, Asp, Asn,
Arg, Ser, Ala, Ile, Glu or His;
- Xaa at position 46 is Asp, Phe, Ser, Thr, Cys, Glu, Asn, Gln,
Lys, His, Ala,
Tyr, Ile, Val or Gly;
- 10 Xaa at position 47 is Ile, Gly, Val, Ser, Arg, Pro, or His;
Xaa at position 48 is Leu, Ser, Cys, Arg, Ile, His, Phe, Glu,
Lys, Thr, Ala,
Met, Val or Asn;
- Xaa at position 49 is Met, Arg, Ala, Gly, Pro, Asn, His, or Asp;
- 15 Xaa at position 50 is Glu, Leu, Thr, Asp, Tyr, Lys, Asn, Ser,
Ala, Ile, Val,
His, Phe, Met or Gln;
- Xaa at position 51 is Asn, Arg, Met, Pro, Ser, Thr, or His;
Xaa at position 52 is Asn, His, Arg, Leu, Gly, Ser, or Thr;
- 20 Xaa at position 53 is Leu, Thr, Ala, Gly, Glu, Pro, Lys, Ser, or
Met;
Xaa at position 54 is Arg, Asp, Ile, Ser, Val, Thr, Gln, Asn,
Lys,
His, Ala or Leu;
- 25 Xaa at position 55 is Arg, Thr, Val, Ser, Leu, or Gly;
Xaa at position 56 is Pro, Gly, Cys, Ser, Gln, Glu, Arg, His,
Thr, Ala, Tyr, Phe, Leu, Val or Lys;
- Xaa at position 57 is Asn or Gly;
Xaa at position 58 is Leu, Ser, Asp, Arg, Gln, Val, or Cys;
- 30 Xaa at position 59 is Glu Tyr, His, Leu, Pro, or Arg;
Xaa at position 60 is Ala, Ser, Pro, Tyr, Asn, or Thr;
Xaa at position 61 is Phe, Asn, Glu, Pro, Lys, Arg, or Ser;
Xaa at position 62 is Asn His, Val, Arg, Pro, Thr, Asp, or Ile;
Xaa at position 63 is Arg, Tyr, Trp, Lys, Ser, His, Pro, or Val;
- 35 Xaa at position 64 is Ala, Asn, Pro, Ser, or Lys;
Xaa at position 65 is Val, Thr, Pro, His, Leu, Phe, or Ser;

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Xaa at position 66 is Lys, Ile, Arg, Val, Asn, Glu, or Ser;
Xaa at position 67 is Ser, Ala, Phe, Val, Gly, Asn, Ile, Pro, or
His;
Xaa at position 68 is Leu, Val, Trp, Ser, Ile, Phe, Thr, or His;
5 Xaa at position 69 is Gln, Ala, Pro, Thr, Glu, Arg, Trp, Gly, or
Leu;
Xaa at position 70 is Asn, Leu, Val, Trp, Pro, or Ala;
Xaa at position 71 is Ala, Met, Leu, Pro, Arg, Glu, Thr, Gln,
Trp, or Asn;
10 Xaa at position 72 is Ser, Glu, Met, Ala, His, Asn, Arg, or Asp;
Xaa at position 73 is Ala, Glu, Asp, Leu, Ser, Gly, Thr, or Arg;
Xaa at position 74 is Ile, Met, Thr, Pro, Arg, Gly, Ala;
Xaa at position 75 is Glu, Lys, Gly, Asp, Pro, Trp, Arg, Ser,
Gln, or Leu;
15 Xaa at position 76 is Ser, Val, Ala, Asn, Trp, Glu, Pro, Gly, or
Asp;
Xaa at position 77 is Ile, Ser, Arg, Thr, or Leu;
Xaa at position 78 is Leu, Ala, Ser, Glu, Phe, Gly, or Arg;
Xaa at position 79 is Lys, Thr, Asn, Met, Arg, Ile, Gly, or
20 Asp;
Xaa at position 80 is Asn, Trp, Val, Gly, Thr, Leu, Glu, or Arg;
Xaa at position 81 is Leu, Gln, Gly, Ala, Trp, Arg, Val, or Lys;
Xaa at position 82 is Leu, Gln, Lys, Trp, Arg, Asp, Glu, Asn,
His,
25 Thr, Ser, Ala, Tyr, Phe, Ile, Met or Val;
Xaa at position 83 is Pro, Ala, Thr, Trp, Arg, or Met;
Xaa at position 84 is Cys, Glu, Gly, Arg, Met, or Val;
Xaa at position 85 is Leu, Asn, Val, or Gln;
Xaa at position 86 is Pro, Cys, Arg, Ala, or Lys;
30 Xaa at position 87 is Leu, Ser, Trp, or Gly;
Xaa at position 88 is Ala, Lys, Arg, Val, or Trp;
Xaa at position 89 is Thr, Asp, Cys, Leu, Val, Glu, His, Asn, or
Ser;
Xaa at position 90 is Ala, Pro, Ser, Thr, Gly, Asp, Ile, or Met;
35 Xaa at position 91 is Ala, Pro, Ser, Thr, Phe, Leu, Asp, or His;
Xaa at position 92 is Pro, Phe, Arg, Ser, Lys, His, Ala, Gly, Ile

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- or Leu;
- Xaa at position 93 is Thr, Asp, Ser, Asn, Pro, Ala, Leu, or Arg;
- Xaa at position 94 is Arg, Ile, Ser, Glu, Leu, Val, Gln, Lys,
His, Ala, or
- 5 Pro;
- Xaa at position 95 is His, Gln, Pro, Arg, Val, Leu, Gly, Thr,
Asn, Lys, Ser,
- Ala, Trp, Phe, Ile, or Tyr;
- Xaa at position 96 is Pro, Lys, Tyr, Gly, Ile, or Thr;
- 10 Xaa at position 97 is Ile, Val, Lys, Ala, or Asn;
- Xaa at position 98 is His, Ile, Asn, Leu, Asp, Ala, Thr,
Glu, Gln, Ser, Phe, Met, Val, Lys, Arg, Tyr or Pro;
- Xaa at position 99 is Ile, Leu, Arg, Asp, Val, Pro, Gln,
Gly, Ser, Phe, or His;
- 15 Xaa at position 100 is Lys, Tyr, Leu, His, Arg, Ile, Ser, Gln,
or Pro;
- Xaa at position 101 is Asp, Pro, Met, Lys, His, Thr, Val,
Tyr, Glu, Asn, Ser, Ala, Gly, Ile, Leu, or Gln;
- Xaa at position 102 is Gly, Leu, Glu, Lys, Ser, Tyr, or Pro;
- 20 Xaa at position 103 is Asp, or Ser;
- Xaa at position 104 is Trp, Val, Cys, Tyr, Thr, Met, Pro, Leu,
Gln, Lys, Ala, Phe, or Gly;
- Xaa at position 105 is Asn, Pro, Ala, Phe, Ser, Trp, Gln, Tyr,
Leu, Lys, Ile, Asp, or His;
- 25 Xaa at position 106 is Glu, Ser, Ala, Lys, Thr, Ile, Gly, or Pro;
- Xaa at position 108 is Arg, Lys, Asp, Leu, Thr, Ile, Gln, His,
Ser, Ala or
- Pro;
- Xaa at position 109 is Arg, Thr, Pro, Glu, Tyr, Leu, Ser, or Gly;
- 30 Xaa at position 110 is Lys, Ala, Asn, Thr, Leu, Arg, Gln, His,
Glu, Ser, Ala,
- or Trp;
- Xaa at position 111 is Leu, Ile, Arg, Asp, or Met;
- Xaa at position 112 is Thr, Val, Gln, Tyr, Glu, His, Ser, or Phe;
- 35 Xaa at position 113 is Phe, Ser, Cys, His, Gly, Trp, Tyr, Asp,
Lys, Leu, Ile, Val or Asn;

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Xaa at position 114 is Tyr, Cys, His, Ser, Trp, Arg, or Leu;
 Xaa at position 115 is Leu, Asn, Val, Pro, Arg, Ala, His, Thr,
 Trp, or Met;
 Xaa at position 116 is Lys, Leu, Pro, Thr, Met, Asp, Val, Glu,
 5 Arg, Trp, Ser, Asn, His, Ala, Tyr, Phe, Gln, or Ile;
 Xaa at position 117 is Thr, Ser, Asn, Ile, Trp, Lys, or Pro;
 Xaa at position 118 is Leu, Ser, Pro, Ala, Glu, Cys, Asp, or Tyr;
 Xaa at position 119 is Glu, Ser, Lys, Pro, Leu, Thr, Tyr, or Arg;
 Xaa at position 120 is Asn, Ala, Pro, Leu, His, Val, or Gln;
 10 Xaa at position 121 is Ala, Ser, Ile, Asn, Pro, Lys, Asp, or
 Gly;
 Xaa at position 122 is Gln, Ser, Met, Trp, Arg, Phe, Pro, His,
 Ile, Tyr, or Cys;
 Xaa at position 123 is Ala, Met, Glu, His, Ser, Pro, Tyr, or Leu;
 15 and which can additionally have Met- preceding the amino acid in
 position 1; and wherein from 1 to 14 amino acids can be deleted
 from the N-terminus and/or from 1 to 15 amino acids can be
 deleted from the C-terminus; and wherein from 4 to 44 of the
 20 amino acids designated by Xaa are different from the
 corresponding amino acids of native (1-133) human interleukin-3.

2. A human interleukin-3 mutant polypeptide of the
 25 Formula II:

Ala	Pro	Met	Thr	Gln	Thr	Thr	Ser	Leu	Lys	Thr	Ser	Trp	Val	Asn
1			5	10					15					
Cys	Xaa	Xaa	Xaa	Xaa	Xaa	Glu	Xaa	Xaa	Xaa	Xaa	Leu	Xaa	Xaa	Xaa
			20	25					30					
Xaa	Xaa	Xaa	Xaa	Xaa	Xaa	Xaa	Xaa	Asn	Leu	Xaa	Xaa	Glu	Xaa	Xaa
			35	40					45					
Xaa	Xaa	Leu	Xaa	Xaa	Xaa	Xaa	Xaa	Xaa	Xaa	Xaa	Asn	Leu	Xaa	Xaa

35

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50 55 60
 Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
 65 70 75
 5 Xaa Xaa Leu Xaa Xaa Xaa Xaa Xaa Cys Xaa Pro Xaa Xaa Xaa Xaa
 80 85 90
 Xaa Xaa Xaa Arg Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Asp Xaa Xaa
 10 95 100 105
 Xaa Phe Xaa Xaa Lys Leu Xaa Phe Xaa Xaa Xaa Xaa Leu Xaa Xaa
 110 115 120
 Xaa Xaa Xaa Gln Gln Thr Thr Leu Ser Leu Ala Ile Phe [SEQ ID
 15 NO:16]
 125 130

wherein

Xaa at position 17 is Ser, Gly, Asp, Met, or Gln;
 20 Xaa at position 18 is Asn, His, Leu, Ile, Phe, Arg, or Gln;
 Xaa at position 19 is Met, Phe, Ile, Arg, or Ala;
 Xaa at position 20 is Ile or Pro;
 Xaa at position 21 is Asp or Glu;
 Xaa at position 23 is Ile, Val, Ala, Leu, or Gly;
 25 Xaa at position 24 is Ile, Val, Phe, or Leu;
 Xaa at position 25 is Thr, His, Gly, Gln, Arg, Pro, or Ala;
 Xaa at position 26 is His, Phe, Gly, Arg, or Ala;
 Xaa at position 28 is Lys, Leu, Gln, Gly, Pro, or Val;
 Xaa at position 29 is Gln, Asn, Leu, Arg, or Val;
 30 Xaa at position 30 is Pro, His, Thr, Gly, or Gln;
 Xaa at position 31 is Pro, Asp, Gly, Ala, Arg, Leu, or Gln;
 Xaa at position 32 is Leu, Arg, Gln, Asn, Gly, Ala, or Glu;
 Xaa at position 33 is Pro, Leu, Gln, Ala, or Glu;
 Xaa at position 34 is Leu, Val, Gly, Ser, Lys, Ala, Arg, Gln,
 35 Glu,
 Ile, Phe, Thr or Met;

- Xaa at position 35 is Leu, Ala, Asn, Pro, Gln, or Val;
Xaa at position 36 is Asp or Leu;
Xaa at position 37 is Phe, Ser, Pro, Trp, or Ile;
Xaa at position 38 is Asn or Ala;
- 5 Xaa at position 41 is Asn, Cys, Arg, His, Met, or Pro;
Xaa at position 42 is Gly, Asp, Ser, Cys, Ala, Asn, Ile, Leu,
Met,
Tyr, Val or Arg;
- Xaa at position 44 is Asp or Glu;
- 10 Xaa at position 45 is Gln, Val, Met, Leu, Thr, Lys, Ala, Asn,
Glu,
Ser, or Trp;
- Xaa at position 46 is Asp, Phe, Ser, Thr, Cys, Ala, Asn, Gln,
Glu,
- 15 His, Ile, Lys, Tyr, Val or Gly;
- Xaa at position 47 is Ile, Val, or His;
Xaa at position 49 is Met, Asn, or Asp;
Xaa at position 50 is Glu, Thr, Ala, Asn, Ser or Asp;
Xaa at position 51 is Asn, Arg, Met, Pro, Ser, Thr, or His;
- 20 Xaa at position 52 is Asn or Gly;
Xaa at position 53 is Leu, Met, or Phe;
Xaa at position 54 is Arg, Ala, or Ser;
Xaa at position 55 is Arg, Thr, Val, Leu, or Gly;
Xaa at position 56 is Pro, Gly, Cys, Ser, Gln, Ala, Arg, Asn,
- 25 Glu, His, Leu,
Thr, Val or Lys;
- Xaa at position 59 is Glu, Tyr, His, Leu, or Arg;
Xaa at position 60 is Ala, Ser, Asn, or Thr;
Xaa at position 61 is Phe or Ser;
- 30 Xaa at position 62 is Asn, Val, Pro, Thr, or Ile;
Xaa at position 63 is Arg, Tyr, Lys, Ser, His, or Val;
Xaa at position 64 is Ala or Asn;
Xaa at position 65 is Val, Thr, Leu, or Ser;
Xaa at position 66 is Lys, Ile, Arg, Val, Asn, Glu, or Ser;
- 35 Xaa at position 67 is Ser, Phe, Val, Gly, Asn, Ile, or His;
Xaa at position 68 is Leu, Val, Ile, Phe, or His;

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Xaa at position 69 is Gln, Ala, Pro, Thr, Glu, Arg, or Gly;
Xaa at position 70 is Asn or Pro;
Xaa at position 71 is Ala, Met, Pro, Arg, Glu, Thr, or Gln;
Xaa at position 72 is Ser, Glu, Met, Ala, His, Asn, Arg, or Asp;
5 Xaa at position 73 is Ala, Glu, Asp, Leu, Ser, Gly, Thr, Arg, or
Pro;
Xaa at position 74 is Ile or Met;
Xaa at position 75 is Glu, Gly, Asp, Ser, or Gln;
Xaa at position 76 is Ser, Val, Ala, Asn, Glu, Pro, Gly, or
10 Asp;
Xaa at position 77 is Ile, Ser, or Leu;
Xaa at position 79 is Lys, Thr, Gly, Asn, Met, Arg, Ile, Gly, or
Asp;
Xaa at position 80 is Asn, Val, Gly, Thr, Leu, Glu, or Arg;
15 Xaa at position 81 is Leu, or Val;
Xaa at position 82 is Leu, Gln, Trp, Arg, Asp, Ala, Asn, Glu,
His,
Met, Phe, Ser, Thr, Tyr or Val;
Xaa at position 83 is Pro, Ala, Thr, Trp, or Met;
20 Xaa at position 85 is Leu or Val;
Xaa at position 87 is Leu or Ser;
Xaa at position 88 is Ala, Arg, or Trp;
Xaa at position 89 is Thr, Asp, Glu, His, Asn, or Ser;
Xaa at position 90 is Ala, Asp, or Met;
25 Xaa at position 91 is Ala, Pro, Ser, Thr, Phe, Leu, or Asp;
Xaa at position 92 is Pro or Ser;
Xaa at position 93 is Thr, Asp, Ser, Pro, Ala, Leu, or Arg;
Xaa at position 95 is His, Pro, Arg, Val, Leu, Gly, Asn, Ile,
Phe,
30 Ser or Thr;
Xaa at position 96 is Pro or Tyr;
Xaa at position 97 is Ile, Val, or Ala;
Xaa at position 98 is His, Ile, Asn, Leu, Asp, Ala, Thr, Leu,
Arg, Gln, Glu,
35 Lys, Met, Ser, Tyr, Val or Pro;
Xaa at position 99 is Ile, Leu, Val, or Phe;

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- Xaa at position 100 is Lys, Leu, His, Arg, Ile, Gln, Pro, or Ser;
- Xaa at position 101 is Asp, Pro, Met, Lys, His, Thr, Val, Asn, Ile, Leu or Tyr;
- 5 Xaa at position 102 is Gly, Glu, Lys, or Ser;
- Xaa at position 104 is Trp, Val, Tyr, Met, or Leu;
- Xaa at position 105 is Asn, Pro, Ala, Phe, Ser, Trp, Gln, Tyr, Leu, Lys, Ile, Asp, or His;
- Xaa at position 106 is Glu, Ser, Ala, or Gly;
- 10 Xaa at position 108 is Arg, Ala, Gln, Ser or Lys;
- Xaa at position 109 is Arg, Thr, Glu, Leu, Ser, or Gly;
- Xaa at position 112 is Thr, Val, Gln, Glu, His, or Ser;
- Xaa at position 114 is Tyr or Trp;
- Xaa at position 115 is Leu or Ala;
- 15 Xaa at position 116 is Lys, Thr, Met, Val, Trp, Ser, Leu, Ala, Asn,
- Gln, His, Met, Phe, Tyr or Ile;
- Xaa at position 117 is Thr, Ser, or Asn;
- Xaa at position 119 is Glu, Ser, Pro, Leu, Thr, or Tyr;
- 20 Xaa at position 120 is Asn, Pro, Leu, His, Val, or Gln;
- Xaa at position 121 is Ala, Ser, Ile, Asn, Pro, Lys, Asp, or Gly;
- Xaa at position 122 is Gln, Ser, Met, Trp, Arg, Phe, Pro, His, Ile, Tyr, or Cys;
- 25 Xaa at position 123 is Ala, Met, Glu, His, Ser, Pro, Tyr, or Leu;

and which can additionally have Met- preceding the amino acid in position 1; and wherein from 1 to 14 amino acids can be deleted from the N-terminus and/or from 1 to 15 amino acids can be

30 deleted from the C-terminus; and wherein from 4 to 44 of the amino acids designated by Xaa are different from the corresponding amino acids of native (1-133) human interleukin-3.

3. A human interleukin-3 mutant polypeptide

35 according to claim 2 of the Formula III:

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Ala Pro Met Thr Gln Thr Thr Ser Leu Lys Thr Ser Trp Val Asn
 1 5 10 15

Cys Xaa Xaa Xaa Ile Xaa Glu Xaa Xaa Xaa Xaa Leu Lys Xaa Xaa
 5 20 25 30

Xaa Xaa Xaa Xaa Xaa Asp Xaa Xaa Asn Leu Asn Xaa Glu Xaa Xaa
 35 40 45

10 Xaa Ile Leu Met Xaa Xaa Asn Leu Xaa Xaa Xaa Asn Leu Glu Xaa
 50 55 60

Phe Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Asn Xaa Xaa Xaa Ile Glu
 65 70 75

15 Xaa Xaa Leu Xaa Xaa Leu Xaa Xaa Cys Xaa Pro Xaa Xaa Thr Ala
 80 85 90

Xaa Pro Xaa Arg Xaa Xaa Xaa Xaa Xaa Xaa Xaa Gly Asp Xaa Xaa
 20 95 100 105

Xaa Phe Xaa Xaa Lys Leu Xaa Phe Xaa Xaa Xaa Xaa Leu Glu Xaa
 110 115 120

25 Xaa Xaa Xaa Gln Gln Thr Thr Leu Ser Leu Ala Ile Phe [SEQ ID
 NO:17]
 125 130

wherein

- 30 Xaa at position 17 is Ser, Gly, Asp, Met, or Gln;
 Xaa at position 18 is Asn, His, or Ile;
 Xaa at position 19 is Met or Ile;
 Xaa at position 21 is Asp or Glu;
 Xaa at position 23 is Ile, Ala, Leu, or Gly;
 35 Xaa at position 24 is Ile, Val, or Leu;
 Xaa at position 25 is Thr, His, Gln, or Ala;

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- Xaa at position 26 is His or Ala;
Xaa at position 29 is Gln, Asn, or Val;
Xaa at position 30 is Pro, Gly, or Gln;
Xaa at position 31 is Pro, Asp, Gly, or Gln;
5 Xaa at position 32 is Leu, Arg, Gln, Asn, Gly, Ala, or Glu;
Xaa at position 33 is Pro or Glu;
Xaa at position 34 is Leu, Val, Gly, Ser, Lys, Ala, Arg, Gln,
Glu, Ile, Phe, Thr or Met;
Xaa at position 35 is Leu, Ala, Asn, Pro, Gln, or Val;
10 Xaa at position 37 is Phe, Ser, Pro, or Trp;
Xaa at position 38 is Asn or Ala;
Xaa at position 42 is Gly, Asp, Ser, Cys, Ala, Asn, Ile, Leu,
Met, Tyr or Arg;
Xaa at position 44 is Asp or Glu;
15 Xaa at position 45 is Gln, Val, Met, Leu, Thr, Ala, Asn, Glu,
Ser or Lys;
Xaa at position 46 is Asp, Phe, Ser, Thr, Ala, Asn, Gln, Glu, His,
Ile, Lys, Tyr, Val or Cys;
Xaa at position 50 is Glu, Ala, Asn, Ser or Asp;
20 Xaa at position 51 is Asn, Arg, Met, Pro, Ser, Thr, or His;
Xaa at position 54 is Arg or Ala;
Xaa at position 55 is Arg, Thr, Val, Leu, or Gly;
Xaa at position 56 is Pro, Gly, Ser, Gln, Ala, Arg, Asn, Glu,
Leu, Thr, Val or Lys;
25 Xaa at position 60 is Ala or Ser;
Xaa at position 62 is Asn, Pro, Thr, or Ile;
Xaa at position 63 is Arg or Lys;
Xaa at position 64 is Ala or Asn;
Xaa at position 65 is Val or Thr;
30 Xaa at position 66 is Lys or Arg;
Xaa at position 67 is Ser, Phe, or His;
Xaa at position 68 is Leu, Ile, Phe, or His;
Xaa at position 69 is Gln, Ala, Pro, Thr, Glu, Arg, or Gly;
Xaa at position 71 is Ala, Pro, or Arg;
35 Xaa at position 72 is Ser, Glu, Arg, or Asp;
Xaa at position 73 is Ala or Leu;

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- Xaa at position 76 is Ser, Val, Ala, Asn, Glu, Pro, or Gly;
Xaa at position 77 is Ile or Leu;
Xaa at position 79 is Lys, Thr, Gly, Asn, Met, Arg, Ile, Gly, or Asp;
5 Xaa at position 80 is Asn, Gly, Glu, or Arg;
Xaa at position 82 is Leu, Gln, Trp, Arg, Asp, Ala, Asn, Glu, His,
Ile, Met, Phe, Ser, Thr, Tyr or Val;
Xaa at position 83 is Pro or Thr;
10 Xaa at position 85 is Leu or Val;
Xaa at position 87 is Leu or Ser;
Xaa at position 88 is Ala or Trp;
Xaa at position 91 is Ala or Pro;
Xaa at position 93 is Thr, Asp, Ser, Pro, Ala, Leu, or Arg;
15 Xaa at position 95 is His, Pro, Arg, Val, Leu, Gly, Asn, Phe, Ser or Thr;
Xaa at position 96 is Pro or Tyr;
Xaa at position 97 is Ile or Val;
Xaa at position 98 is His, Ile, Asn, Leu, Ala, Thr, Leu, Arg,
20 Gln,
Leu, Lys, Met, Ser, Tyr, Val or Pro;
Xaa at position 99 is Ile, Leu, or Val;
Xaa at position 100 is Lys, Arg, Ile, Gln, Pro, or Ser;
Xaa at position 101 is Asp, Pro, Met, Lys, His, Thr, Pro, Asn,
25 Ile, Leu or Tyr;
Xaa at position 104 is Trp or Leu;
Xaa at position 105 is Asn, Pro, Ala, Ser, Trp, Gln, Tyr, Leu, Lys, Ile, Asp, or His;
Xaa at position 106 is Glu or Gly;
30 Xaa at position 108 is Arg, Ala, or Ser;
Xaa at position 109 is Arg, Thr, Glu, Leu, or Ser;
Xaa at position 112 is Thr, Val, or Gln;
Xaa at position 114 is Tyr or Trp;
Xaa at position 115 is Leu or Ala;
35 Xaa at position 116 is Lys, Thr, Val, Trp, Ser, Ala, His, Met, Phe, Tyr or Ile;

Xaa at position 117 is Thr or Ser;

Xaa at position 120 is Asn, Pro, Leu, His, Val, or Gln;

Xaa at position 121 is Ala, Ser, Ile, Asn, Pro, Asp, or ~~Gly~~;

Xaa at position 122 is Gln, Ser, Met, Trp, Arg, Phe, ~~Pro~~, His,

5 Ile, Tyr, or Cys;

Xaa at position 123 is Ala, Met, Glu, His, Ser, Pro/ Tyr, or Leu;

and which can additionally have Met- preceding the amino acid in position 1; and wherein from 1 to 14 amino acids can be deleted from the N-terminus and/or from 1 to 15 amino acids can be deleted from the C-terminus; and wherein from 4 to 35 of the amino acids designated by Xaa are different from the corresponding amino acids of native (1-133)human interleukin-3.

15 4. A human interleukin-3 mutant polypeptide according to
Claim 3 of the Formula IV:

Ala Pro Met Thr Gln Thr Thr Ser ~~Leu~~ Lys Thr Ser Trp Val Asn
1 5 10 15

20

Cys Xaa Xaa Met Ile Asp Glu ~~Xaa~~ Ile Xaa Xaa Leu Lys Xaa Xaa
20 25 30

25

Pro Xaa Pro Xaa Xaa Asp Phe Xaa Asn Leu Asn Xaa Glu Asp Xaa
35 40 45

Xaa Ile Leu Met Xaa Xaa Asn Leu Arg Xaa Xaa Asn Leu Glu Ala
50 55 60

30

Phe Xaa Arg Xaa Xaa Lys Xaa Xaa Xaa Asn Ala Ser Ala Ile Glu
65 70 75

Xaa Xaa Leu Xaa Xaa Leu Xaa Pro Cys Leu Pro Xaa Xaa Thr Ala
80 85 90

35

Xaa Pro ~~Xaa~~ Arg Xaa Pro Ile Xaa Xaa Xaa Xaa Gly Asp Trp Xaa

305

95 100 105

Glu Phe Xaa Xaa Lys Leu Xaa Phe Tyr Leu Xaa Xaa Leu Glu Xaa

110 115 120

5

Xaa Xaa Xaa Gln Gln Thr Thr Leu Ser Leu Ala Ile Phe [SEQ ID
NO:18]

125 130

wherein

- 10 Xaa at position 17 is Ser, Gly, Asp, or Gln;
 Xaa at position 18 is Asn, His, or Ile;
 Xaa at position 23 is Ile, Ala, Leu, or Gly;
 Xaa at position 25 is Thr, His, or Gln;
 Xaa at position 26 is His or Ala;
- 15 Xaa at position 29 is Gln or Asn;
 Xaa at position 30 is Pro or Gly;
 Xaa at position 32 is Leu, Arg, Asn, or Ala;
 Xaa at position 34 is Leu, Val, Ser, Ala, Arg, Gln, Glu, Ile,
 Phe, Thr, or Met;
- 20 Xaa at position 35 is Leu, Ala, Asn, or Pro;
 Xaa at position 38 is Asn or Ala;
 Xaa at position 42 is Gly, Asp, Ser, Ala, Asn, Ile, Leu, Met,
 Tyr or Arg;
- Xaa at position 45 is Gln, Val, Met, Leu, Ala, Asn, Glu, or Lys;
- 25 Xaa at position 46 is Asp, Phe, Ser, Gln, Glu, His, Val
 or Thr;
- Xaa at position 50 is Glu Asn, Ser or Asp;
 Xaa at position 51 is Asn, Arg, Pro, Thr, or His;
 Xaa at position 55 is Arg, Leu, or Gly;
- 30 Xaa at position 56 is Pro, Gly, Ser, Ala, Asn, Val, Leu or Gln;
 Xaa at position 62 is Asn, Pro, or Thr;
 Xaa at position 64 is Ala or Asn;
 Xaa at position 65 is Val or Thr;
 Xaa at position 67 is Ser or Phe;
- 35 Xaa at position 68 is Leu or Phe;
 Xaa at position 69 is Gln, Ala, Glu, or Arg;

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- Xaa at position 76 is Ser, Val, Asn, Pro, or Gly;
 Xaa at position 77 is Ile or Leu;
 Xaa at position 79 is Lys, Gly, Asn, Met, Arg, Ile, or Gly;
 Xaa at position 80 is Asn, Gly, Glu, or Arg;
 5 Xaa at position 82 is Leu, Gln, Trp, Arg, Asp, Asn, Glu, His, Met,
 Phe, Ser, Thr, Tyr or Val;
 Xaa at position 87 is Leu or Ser;
 Xaa at position 88 is Ala or Trp;
 10 Xaa at position 91 is Ala or Pro;
 Xaa at position 93 is Thr, Asp, or Ala;
 Xaa at position 95 is His, Pro, Arg, Val, Gly, Asn, Ser or Thr;
 Xaa at position 98 is His, Ile, Asn, Ala, Thr, Gln, Glu,
 Lys, Met, Ser, Tyr, Val or Leu;
 15 Xaa at position 99 is Ile or Leu;
 Xaa at position 100 is Lys or Arg;
 Xaa at position 101 is Asp, Pro, Met, Lys, Thr, His, Pro, Asn, Ile,
 Leu or Tyr;
 20 Xaa at position 105 is Asn, Pro, Ser, Ile or Asp;
 Xaa at position 108 is Arg, Ala, or Ser;
 Xaa at position 109 is Arg, Thr, Glu, Leu, or Ser;
 Xaa at position 112 is Thr or Gln;
 Xaa at position 116 is Lys, Val, Trp, Ala, His, Phe, Tyr or Ile;
 25 Xaa at position 117 is Thr or Ser;
 Xaa at position 120 is Asn, Pro, Leu, His, Val, or Gln;
 Xaa at position 121 is Ala, Ser, Ile, Pro, or Asp;
 Xaa at position 122 is Gln, Met, Trp, Phe, Pro, His, Ile, or Tyr;
 Xaa at position 123 is Ala, Met, Glu, Ser, or Leu;
 30
 and which can additionally have Met- preceding the amino acid in position 1; and wherein from 1 to 14 amino acids can be deleted from the N-terminus and/or from 1 to 15 amino acids can be deleted from the C-terminus; and wherein from 4 to 44 of the
 35 amino acids designated by Xaa are different from the corresponding amino acids of native (1-133)human interleukin-3.

5. The human interleukin-3 mutant polypeptide of claim 1 wherein 1-15 amino acids are deleted from the C-terminus and/or 1-14 amino acids are deleted from the N-terminus.

5

6. The human interleukin-3 mutant polypeptide of claim 1 wherein;

Xaa at position 42 is Gly, Asp, Ser, Ile, Leu, Met, Tyr, or Ala;
 10 Xaa at position 45 is Gln, Val, Met or Asn;
 Xaa at position 46 is Asp, Ser, Gln, His or Val;
 Xaa at position 50 is Glu or Asp;
 Xaa at position 51 is Asn, Pro or Thr;
 Xaa at position 62 is Asn or Pro;
 15 Xaa at position 76 is Ser, or Pro;
 Xaa at position 82 is Leu, Trp, Asp, Asn Glu, His, Phe, Ser or Tyr;
 Xaa at position 95 is His, Arg, Thr, Asn or Ser;
 Xaa at position 98 is His, Ile, Leu, Ala, Gln, Lys, Met, Ser,
 20 Tyr or Val;.
 Xaa at position 100 is Lys or Arg;
 Xaa at position 101 is Asp, Pro, His, Asn, Ile or Leu;
 Xaa at position 105 is Asn, or Pro;
 Xaa at position 108 is Arg, Ala, or Ser;
 25 Xaa at position 116 is Lys, Val, Trp, Ala, His, Phe, or Tyr;
 Xaa at position 121 is Ala, or Ile;
 Xaa at position 122 is Gln, or Ile; and
 Xaa at position 123 is Ala, Met or Glu.

30

7. A (15-125)human interleukin-3 mutant polypeptide of the Formula V:

Asn Cys Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
 1 5 10 15

35

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Asn Xaa Xaa Xaa Xaa Xaa

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20 25 30
 Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
 35 40 45
 5 Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
 50 55 60
 Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
 10 65 70 75
 Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
 80 85 90
 15 Xaa Xaa Phe Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
 95 100 105
 Xaa Xaa Xaa Xaa Gln Gln [SEQ ID NO:19]
 110
 20 wherein
 Xaa at position 3 is Ser, Lys, Gly, Asp, Met, Gln, or Arg;
 Xaa at position 4 is Asn, His, Leu, Ile, Phe, Arg, or Gln;
 Xaa at position 5 is Met, Phe, Ile, Arg, Gly, Ala, or Cys;
 25 Xaa at position 6 is Ile, Cys, Gln, Glu, Arg, Pro, or Ala;
 Xaa at position 7 is Asp, Phe, Lys, Arg, Ala, Gly, Glu, Gln, Asn,
 Thr, Ser or Val;
 Xaa at position 8 is Glu, Trp, Pro, Ser, Ala, His, Asp, Asn, Gln,
 Leu, Val, or Gly;
 30 Xaa at position 9 is Ile, Val, Ala, Leu, Gly, Trp, Lys, Phe,
 Leu, Ser, or Arg;
 Xaa at position 10 is Ile, Gly, Val, Arg, Ser, Phe, or Leu;
 Xaa at position 11 is Thr, His, Gly, Gln, Arg, Pro, or Ala;
 Xaa at position 12 is His, Thr, Phe, Gly, Arg, Ala, or Trp;
 35 Xaa at position 13 is Leu, Gly, Arg, Thr, Ser, or Ala;
 Xaa at position 14 is Lys, Arg, Leu, Gln, Gly, Pro, Val or Trp;

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- Xaa at position 15 is Gln, Asn, Leu, Pro, Arg, or Val;
Xaa at position 16 is Pro, His, Thr, Gly, Asp, Gln, Ser, Leu, or Lys;
Xaa at position 17 is Pro, Asp, Gly, Ala, Arg, Leu, or Gln;
5 Xaa at position 18 is Leu, Val, Arg, Gln, Asn, Gly, Ala, or Glu;
Xaa at position 19 is Pro, Leu, Gln, Ala, Thr, or Glu;
Xaa at position 20 is Leu, Val, Gly, Ser, Lys, Glu, Gln, Thr, Arg, Ala, Phe, Ile or Met;
Xaa at position 21 is Leu, Ala, Gly, Asn, Pro, Gln, or Val;
10 Xaa at position 22 is Asp, Leu, or Val;
Xaa at position 23 is Phe, Ser, Pro, Trp, or Ile;
Xaa at position 24 is Asn, or Ala;
Xaa at position 26 is Leu, Trp, or Arg;
Xaa at position 27 is Asn, Cys, Arg, Leu, His, Met, Pro;
15 Xaa at position 28 is Gly, Asp, Ser, Cys, Ala, Lys, Asn, Thr, Leu, Val, Glu, Phe, Tyr, Ile or Met;
Xaa at position 29 is Glu, Asn, Tyr, Leu, Phe, Asp, Ala, Cys, Gln,
20 Arg, Thr, Gly or Ser;
Xaa at position 30 is Asp, Ser, Leu, Arg, Lys, Thr, Met, Trp, Glu, Asn, Gln, Ala or Pro;
Xaa at position 31 is Gln, Pro, Phe, Val, Met, Leu, Thr, Lys, Asp,
25 Asn, Arg, Ser, Ala, Ile, Glu, His or Trp;
Xaa at position 32 is Asp, Phe, Ser, Thr, Cys, Glu, Asn, Gln, Lys, His, Ala, Tyr, Ile, Val or Gly;
Xaa at position 33 is Ile, Gly, Val, Ser, Arg, Pro, or His;
Xaa at position 34 is Leu, Ser, Cys, Arg, Ile, His, Phe, Glu,
30 Lys, Thr, Ala, Met, Val or Asn;
Xaa at position 35 is Met, Arg, Ala, Gly, Pro, Asn, His, or Asp;
Xaa at position 36 is Glu, Leu, Thr, Asp, Tyr, Lys, Asn, Ser, Ala, Ile, Val, His, Phe, Met or Gln;
35 Xaa at position 37 is Asn, Arg, Met, Pro, Ser, Thr, or His;
Xaa at position 38 is Asn, His, Arg, Leu, Gly, Ser, or Thr;

- Xaa at position 39 is Leu, Thr, Ala, Gly, Glu, Pro, Lys, Ser
Met, or;
- Xaa at position 40 is Arg, Asp, Ile, Ser, Val, Thr, Gln, Asn,
Lys, His, Ala or Leu;
- 5 Xaa at position 41 is Arg, Thr, Val, Ser, Leu, or Gly;
Xaa at position 42 is Pro, Gly, Cys, Ser, Gln, Glu, Arg, His,
Thr, Ala, Tyr, Phe, Leu, Val or Lys;
- Xaa at position 43 is Asn or Gly;
- Xaa at position 44 is Leu, Ser, Asp, Arg, Gln, Val, or Cys;
- 10 Xaa at position 45 is Glu Tyr, His, Leu, Pro, or Arg;
Xaa at position 46 is Ala, Ser, Pro, Tyr, Asn, or Thr;
Xaa at position 47 is Phe, Asn, Glu, Pro, Lys, Arg, or Ser;
Xaa at position 48 is Asn, His, Val, Arg, Pro, Thr, Asp, or Ile;
Xaa at position 49 is Arg, Tyr, Trp, Lys, Ser, His, Pro, or Val;
- 15 Xaa at position 50 is Ala, Asn, Pro, Ser, or Lys;
Xaa at position 51 is Val, Thr, Pro, His, Leu, Phe, or Ser;
Xaa at position 52 is Lys, Ile, Arg, Val, Asn, Glu, or Ser;
Xaa at position 53 is Ser, Ala, Phe, Val, Gly, Asn, Ile, Pro, or
His;
- 20 Xaa at position 54 is Leu, Val, Trp, Ser, Ile, Phe, Thr, or His;
Xaa at position 55 is Gln, Ala, Pro, Thr, Glu, Arg, Trp, Gly, or
Leu;
- Xaa at position 56 is Asn, Leu, Val, Trp, Pro, or Ala;
- Xaa at position 57 is Ala, Met, Leu, Pro, Arg, Glu, Thr, Gln,
25 Trp, or Asn;
- Xaa at position 58 is Ser, Glu, Met, Ala, His, Asn, Arg, or Asp;
Xaa at position 59 is Ala, Glu, Asp, Leu, Ser, Gly, Thr, or Arg;
Xaa at position 60 is Ile, Met, Thr, Pro, Arg, Gly, Ala;
Xaa at position 61 is Glu, Lys, Gly, Asp, Pro, Trp, Arg, Ser,
30 Gln, or Leu;
- Xaa at position 62 is Ser, Val, Ala, Asn, Trp, Glu, Pro, Gly, or
Asp;
- Xaa at position 63 is Ile, Ser, Arg, Thr, or Leu;
- Xaa at position 64 is Leu, Ala, Ser, Glu, Phe, Gly, or Arg;
- 35 Xaa at position 65 is Lys, Thr, Gly, Asn, Met, Arg, Ile, or
Asp;

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- Xaa at position 66 is Asn, Trp, Val, Gly, Thr, Leu, Glu, or Arg;
Xaa at position 67 is Leu, Gln, Gly, Ala, Trp, Arg, Val, or Lys;
Xaa at position 68 is Leu, Gln, Lys, Trp, Arg, Asp, Glu, Asn,
His, Thr, Ser, Ala, Tyr, Phe, Ile, Met or Val;
- 5 Xaa at position 69 is Pro, Ala, Thr, Trp, Arg, or Met;
Xaa at position 70 is Cys, Glu, Gly, Arg, Met, or Val;
Xaa at position 71 is Leu, Asn, Val, or Gln;
Xaa at position 72 is Pro, Cys, Arg, Ala, or Lys;
Xaa at position 73 is Leu, Ser, Trp, or Gly;
- 10 Xaa at position 74 is Ala, Lys, Arg, Val, or Trp;
Xaa at position 75 is Thr, Asp, Cys, Leu, Val, Glu, His, Asn, or
Ser;
Xaa at position 76 is Ala, Pro, Ser, Thr, Gly, Asp, Ile, or Met;
Xaa at position 77 is Ala, Pro, Ser, Thr, Phe, Leu, Asp, or His;
- 15 Xaa at position 78 is Pro, Phe, Arg, Ser, Lys, His, Ala, Gly, Ile
or Leu;
Xaa at position 79 is Thr, Asp, Ser, Asn, Pro, Ala, Leu, or Arg;
Xaa at position 80 is Arg, Ile, Ser, Glu, Leu, Val, Gln, Lys,
His,
- 20 Ala or Pro;
Xaa at position 81 is His, Gln, Pro, Arg, Val, Leu, Gly, Thr,
Asn,
Lys, Ser, Ala, Trp, Phe, Ile or Tyr;
- Xaa at position 82 is Pro, Lys, Tyr, Gly, Ile, or Thr;
- 25 Xaa at position 83 is Ile, Val, Lys, Ala, or Asn;
Xaa at position 84 is His, Ile, Asn, Leu, Asp, Ala, Thr, Glu,
Gln, Ser, Phe, Met, Val, Lys, Arg, Tyr or Pro;
Xaa at position 85 is Ile, Leu, Arg, Asp, Val, Pro, Gln,
Gly, Ser, Phe, or His;
- 30 Xaa at position 86 is Lys, Tyr, Leu, His, Arg, Ile, Ser, Gln,
Pro;
Xaa at position 87 is Asp, Pro, Met, Lys, His, Thr, Val,
Tyr, Glu, Asn, Ser, Ala, Gly, Ile, Leu or Gln;
Xaa at position 88 is Gly, Leu, Glu, Lys, Ser, Tyr, or Pro;
- 35 Xaa at position 89 is Asp, or Ser;
Xaa at position 90 is Trp, Val, Cys, Tyr, Thr, Met, Pro, Leu,

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- Gln, Lys, Ala, Phe, or Gly;
- Xaa at position 91 is Asn, Pro, Ala, Phe, Ser, Trp, Gln, Tyr,
Leu, Lys, Ile, Asp, or His;
- Xaa at position 92 is Glu, Ser, Ala, Lys, Thr, Ile, Gly, or Pro;
- 5 Xaa at position 94 is Arg, Lys, Asp, Leu, Thr, Ile, Gln,
His, Ser, Ala, or Pro;
- Xaa at position 95 is Arg, Thr, Pro, Glu, Tyr, Leu, Ser, or Gly;
- Xaa at position 96 is Lys, Asn, Thr, Leu, Gln, Arg,
His, Glu, Ser, Ala or Trp;
- 10 Xaa at position 97 is Leu, Ile, Arg, Asp, or Met;
- Xaa at position 98 is Thr, Val, Gln, Tyr, Glu, His, Ser, or Phe;
- Xaa at position 99 is Phe, Ser, Cys, His, Gly, Trp, Tyr, Asp,
Lys, Leu, Ile, Val or Asn;
- Xaa at position 100 is Tyr, Cys, His, Ser, Trp, Arg, or Leu;
- 15 Xaa at position 101 is Leu, Asn, Val, Pro, Arg, Ala, His, Thr,
Trp, or Met;
- Xaa at position 102 is Lys, Leu, Pro, Thr, Met, Asp, Val, Glu,
Arg, Trp, Ser,
Asn, His, Ala, Tyr, Phe, Gln, or Ile;
- 20 Xaa at position 103 is Thr, Ser, Asn, Ile, Trp, Lys, or Pro;
- Xaa at position 104 is Leu, Ser, Pro, Ala, Glu, Cys, Asp, or Tyr;
- Xaa at position 105 is Glu, Ser, Lys, Pro, Leu, Thr, Tyr, or Arg;
- Xaa at position 106 is Asn, Ala, Pro, Leu, His, Val, or Gln;
- Xaa at position 107 is Ala, Ser, Ile, Asn, Pro, Lys, Asp, or
25 Gly;
- Xaa at position 108 is Gln, Ser, Met, Trp, Arg, Phe, Pro, His,
Ile, Tyr, or Cys;
- Xaa at position 109 is Ala, Met, Glu, His, Ser, Pro, Tyr, or Leu;
- 30 and which can additionally have Met- or Met-Ala- preceding the
amino acid in position 1; and wherein from 4 to 44 of the amino
acids designated by Xaa are different from the corresponding
native amino acids of (1-133) human interleukin-3; or a
polypeptide having substantially the same structure and
35 substantially the same biological activity.

30 Xaa at position 3 is Ser, Gly, Asp, Met, or Gln;
Xaa at position 4 is Asn, His, Leu, Ile, Phe, Arg, or Gln;
Xaa at position 5 is Met, Phe, Ile, Arg, or Ala;
Xaa at position 6 is Ile or Pro;
Xaa at position 7 is Asp, or Glu;
Xaa at position 9 is Ile, Val, Ala, Leu, or Gly;
35 Xaa at position 10 is Ile, Val, Phe, or Leu;
Xaa at position 11 is Thr, His, Gly, Gln, Arg, Pro, or Ala;

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- Xaa at position 12 is His, Phe, Gly, Arg, or Ala;
Xaa at position 14 is Lys, Leu, Gln, Gly, Pro, or Val;
Xaa at position 15 is Gln, Asn, Leu, Arg, or Val;
Xaa at position 16 is Pro, His, Thr, Gly, or Gln;
5 Xaa at position 17 is Pro, Asp, Gly, Ala, Arg, Leu, or Gln;
Xaa at position 18 is Leu, Arg, Gln, Asn, Gly, Ala, or Glu;
Xaa at position 19 is Pro, Leu, Gln, Ala, or Glu;
Xaa at position 20 is Leu, Val, Gly, Ser, Lys, Ala, Arg, Gln,
Glu, Ile, Phe, Thr or Met;
10 Xaa at position 21 is Leu, Ala, Asn, Pro, Gln, or Val;
Xaa at position 22 is Asp or Leu;
Xaa at position 23 is Phe, Ser, Pro, Trp, or Ile;
Xaa at position 24 is Asn or Ala;
Xaa at position 27 is Asn, Cys, Arg, His, Met, or Pro;
15 Xaa at position 28 is Gly, Asp, Ser, Cys, Ala, Asn, Ile, Leu,
Met, Tyr, or Arg;
Xaa at position 30 is Asp, or Glu;
Xaa at position 31 is Gln, Val, Met, Leu, Thr, Lys, Ala, Asn Glu,
Ser or Trp;
20 Xaa at position 32 is Asp, Phe, Ser, Thr, Cys, Ala, Asn, Gln,
Glu, His, Ile, Lys, Tyr, Val or Gly;
Xaa at position 33 is Ile, Val, or His;
Xaa at position 35 is Met, Asn, or Asp;
Xaa at position 36 is Glu, Thr, Ala, Asn, Ser or Asp;
25 Xaa at position 37 is Asn, Arg, Met, Pro, Ser, Thr, or His;
Xaa at position 38 is Asn or Gly;
Xaa at position 39 is Leu, Met, or Phe;
Xaa at position 40 is Arg, Ala or Ser;
Xaa at position 41 is Arg, Thr, Val, Leu, or Gly;
30 Xaa at position 42 is Pro, Gly, Cys, Ser, Gln, Ala, Arg, Asn,
Glu, His, Leu, Thr, Val or Lys;
Xaa at position 45 is Glu, Tyr, His, Leu, or Arg;
Xaa at position 46 is Ala, Ser, Asn, or Thr;
Xaa at position 47 is Phe or Ser;
35 Xaa at position 48 is Asn, Val, Pro, Thr, or Ile;
Xaa at position 49 is Arg, Tyr, Lys, Ser, His, or Val;

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Xaa at position 50 is Ala or Asn;
Xaa at position 51 is Val, Thr, Leu, or Ser;
Xaa at position 52 is Lys, Ile, Arg, Val, Asn, Glu, or Ser;
Xaa at position 53 is Ser, Phe, Val, Gly, Asn, Ile, or His;
5 Xaa at position 54 is Leu, Val, Ile, Phe, or His;
Xaa at position 55 is Gln, Ala, Pro, Thr, Glu, Arg, or Gly;
Xaa at position 56 is Asn or Pro;
Xaa at position 57 is Ala, Met, Pro, Arg, Glu, Thr, or Gln;
Xaa at position 58 is Ser, Glu, Met, Ala, His, Asn, Arg, or Asp;
10 Xaa at position 59 is Ala, Glu, Asp, Leu, Ser, Gly, Thr, Arg, or
Pro;
Xaa at position 60 is Ile or Met;
Xaa at position 61 is Glu, Gly, Asp, Ser, or Gln;
Xaa at position 62 is Ser, Val, Ala, Asn, Glu, Pro, Gly, or
15 Asp;
Xaa at position 63 is Ile, Ser, or Leu;
Xaa at position 65 is Lys, Thr, Gly, Asn, Met, Arg, Ile, or
Asp;
Xaa at position 66 is Asn, Val, Gly, Thr, Leu, Glu, or Arg;
20 Xaa at position 67 is Leu, or Val;
Xaa at position 68 is Leu, Gln, Trp, Arg, Asp, Ala, Asn, Glu,
His, Met, Phe, Ser, Thr, Tyr or Val;
Xaa at position 69 is Pro, Ala, Thr, Trp, or Met;
Xaa at position 71 is Leu or Val;
25 Xaa at position 73 is Leu or Ser;
Xaa at position 74 is Ala, Arg, or Trp;
Xaa at position 75 is Thr, Asp, Glu, His, Asn, or Ser;
Xaa at position 76 is Ala, Asp, or Met;
Xaa at position 77 is Ala, Pro, Ser, Thr, Phe, Leu, or Asp;
30 Xaa at position 78 is Pro or Ser;
Xaa at position 79 is Thr, Asp, Ser, Pro, Ala, Leu, or Arg;
Xaa at position 81 is His, Pro, Arg, Val, Leu, Gly, Asn, Ile,
Phe,
Ser or Thr;
35 Xaa at position 82 is Pro or Tyr;
Xaa at position 83 is Ile, Val, or Ala;

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Xaa at position 84 is His, Ile, Asn, Leu, Asp, Ala, Thr,
Arg, Gln, Glu, Lys, Met, Ser, Tyr, Val or Pro;
Xaa at position 85 is Ile, Leu, Val, or Phe;
Xaa at position 86 is Lys, Leu, His, Arg, Ile, Gln, Pro or
5 Ser;
Xaa at position 87 is Asp, Pro, Met, Lys, His, Thr, Val,
Asn, Ile, Leu or Tyr;
Xaa at position 88 is Gly, Glu, Lys, or Ser;
Xaa at position 90 is Trp, Val, Tyr, Met, or Leu;
10 Xaa at position 91 is Asn, Pro, Ala, Phe, Ser, Trp, Gln, Tyr,
Leu, Lys, Ile, Asp, or His;
Xaa at position 92 is Glu, Ser, Ala, or Gly;
Xaa at position 94 is Arg, Ala, Gln, Ser or Lys;
Xaa at position 95 is Arg, Thr, Glu, Leu, Ser, or Gly;
15 Xaa at position 98 is Thr, Val, Gln, Glu, His, or Ser;
Xaa at position 100 is Tyr or Trp;
Xaa at position 101 is Leu or Ala;
Xaa at position 102 is Lys, Thr, Met, Val, Trp, Ser, Leu,
Ala, Asn, Gln, His, Met, Phe, Tyr or Ile;
20 Xaa at position 103 is Thr, Ser, or Asn;
Xaa at position 105 is Glu, Ser, Pro, Leu, Thr, or Tyr;
Xaa at position 106 is Asn, Pro, Leu, His, Val, or Gln;
Xaa at position 107 is Ala, Ser, Ile, Asn, Pro, Lys, Asp, or
Gly;
25 Xaa at position 108 is Gln, Ser, Met, Trp, Arg, Phe, Pro, His,
Ile, Tyr, or Cys;
Xaa at position 109 is Ala, Met, Glu, His, Ser, Pro, Tyr, or Leu;

and which can additionally have Met- or Met-Ala- preceding the
30 amino acid in position 1; and wherein from 4 to 44 of the amino
acids designated by Xaa are different from the corresponding
amino acids of native (1-133) human interleukin-3; or a
polypeptide having substantially the same structure and
substantially the same biological activity.

35

9. A (15-125)human interleukin-3 mutant polypeptide

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according to Claim 7 of the Formula VII:

Asn Cys Xaa Xaa Xaa Ile Xaa Glu Xaa Xaa Xaa Xaa Leu Lys Xaa
 1 5 10 15
 5
 Xaa Xaa Xaa Xaa Xaa Xaa Asp Xaa Xaa Asn Leu Asn Xaa Glu Xaa
 20 25 30
 Xaa Xaa Ile Leu Met Xaa Xaa Asn Leu Xaa Xaa Xaa Asn Leu Glu
 10 35 40 45
 Xaa Phe Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Asn Xaa Xaa Xaa Ile
 50 55 60
 15 Glu Xaa Xaa Leu Xaa Xaa Leu Xaa Xaa Cys Xaa Pro Xaa Xaa Thr
 65 70 75
 Ala Xaa Pro Xaa Arg Xaa Xaa Xaa Xaa Xaa Xaa Xaa Gly Asp Xaa
 80 85 90
 20
 Xaa Xaa Phe Xaa Xaa Lys Leu Xaa Phe Xaa Xaa Xaa Xaa Leu Glu
 95 100 105
 25 Xaa Xaa Xaa Xaa Gln Gln [SEQ ID NO:21]
 110

wherein

- Xaa at position 3 is Ser, Gly, Asp, Met, or Gln;
 30 Xaa at position 4 is Asn, His, or Ile;
 Xaa at position 5 is Met or Ile;
 Xaa at position 7 is Asp or Glu;
 Xaa at position 9 is Ile, Ala, Leu, or Gly;
 Xaa at position 10 is Ile, Val, or Leu;
 35 Xaa at position 11 is Thr, His, Gln, or Ala;
 Xaa at position 12 is His or Ala;

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- Xaa at position 15 is Gln, Asn, or Val;
Xaa at position 16 is Pro, Gly, or Gln;
Xaa at position 17 is Pro, Asp, Gly, or Gln;
Xaa at position 18 is Leu, Arg, Gln, Asn, Gly, Ala, or Glu;
5 Xaa at position 19 is Pro or Glu;
Xaa at position 20 is Leu, Val, Gly, Ser, Lys, Ala, Arg,
Gln, Glu, Ile, Phe, Thr or Met;
Xaa at position 21 is Leu, Ala, Asn, Pro, Gln, or Val;
Xaa at position 23 is Phe, Ser, Pro, or Trp;
10 Xaa at position 24 is Asn or Ala;
Xaa at position 28 is Gly, Asp, Ser, Cys, Ala, Asn, Ile,
Leu, Met Tyr or Arg;
Xaa at position 30 is Asp or Glu;
Xaa at position 31 is Gln, Val, Met, Leu, Thr, Ala, Asn,
15 Glu, Ser or Lys;
Xaa at position 32 is Asp, Phe, Ser, Thr, Ala, Asn, Gln, Glu,
His, Ile, Lys, Tyr, Val or Cys;
Xaa at position 36 is Glu, Ala, Asn, Ser or Asp;
Xaa at position 37 is Asn, Arg, Met, Pro, Ser, Thr, or His;
20 Xaa at position 40 is Arg or Ala;
Xaa at position 41 is Arg, Thr, Val, Leu, or Gly;
Xaa at position 42 is Pro, Gly, Ser, Gln, Ala, Arg, Asn, Glu,
Leu, Thr, Val or Lys;
Xaa at position 46 is Ala or Ser;
25 Xaa at position 48 is Asn, Pro, Thr, or Ile;
Xaa at position 49 is Arg or Lys;
Xaa at position 50 is Ala or Asn;
Xaa at position 51 is Val or Thr;
Xaa at position 52 is Lys or Arg;
30 Xaa at position 53 is Ser, Phe, or His;
Xaa at position 54 is Leu, Ile, Phe, or His;
Xaa at position 55 is Gln, Ala, Pro, Thr, Glu, Arg, or Gly;
Xaa at position 57 is Ala, Pro, or Arg;
Xaa at position 58 is Ser, Glu, Arg, or Asp;
35 Xaa at position 59 is Ala or Leu;
Xaa at position 62 is Ser, Val, Ala, Asn, Glu, Pro, or Gly;

- Xaa at position 63 is Ile or Leu;
Xaa at position 65 is Lys, Thr, Gly, Asn, Met, Arg, Ile, Gly, or
Asp;
Xaa at position 66 is Asn, Gly, Glu, or Arg;
5 Xaa at position 68 is Leu, Gln, Trp, Arg, Asp, Ala, Asn, Glu,
His, Ile, Met, Phe, Ser, Thr, Tyr or Val;
Xaa at position 69 is Pro or Thr;
Xaa at position 71 is Leu or Val;
Xaa at position 73 is Leu or Ser;
10 Xaa at position 74 is Ala or Trp;
Xaa at position 77 is Ala or Pro;
Xaa at position 79 is Thr, Asp, Ser, Pro, Ala, Leu, or Arg;
Xaa at position 81 is His, Pro, Arg, Val, Leu, Gly, Asn, Phe,
Ser or Thr;
15 Xaa at position 82 is Pro or Tyr;
Xaa at position 83 is Ile or Val;
Xaa at position 84 is His, Ile, Asn, Leu, Ala, Thr, Leu, Arg,
Gln, Leu, Lys, Met, Ser, Tyr, Val or Pro;
Xaa at position 85 is Ile, Leu, or Val;
20 Xaa at position 86 is Lys, Arg, Ile, Gln, Pro, or Ser;
Xaa at position 87 is Asp, Pro, Met, Lys, His, Thr, Asn, Ile,
Leu or Tyr;
Xaa at position 90 is Trp or Leu;
Xaa at position 91 is Asn, Pro, Ala, Ser, Trp, Gln, Tyr, Leu,
25 Lys, Ile, Asp, or His;
Xaa at position 92 is Glu, or Gly;
Xaa at position 94 is Arg, Ala, or Ser;
Xaa at position 95 is Arg, Thr, Glu, Leu, or Ser;
Xaa at position 98 is Thr, Val, or Gln;
30 Xaa at position 100 is Tyr or Trp;
Xaa at position 101 is Leu or Ala;
Xaa at position 102 is Lys, Thr, Val, Trp, Ser, Ala, His,
Met, Phe, Tyr or Ile;
Xaa at position 103 is Thr or Ser;
35 Xaa at position 106 is Asn, Pro, Leu, His, Val, or Gln;
Xaa at position 107 is Ala, Ser, Ile, Asn, Pro, Asp, or Gly;

Xaa at position 108 is Gln, Ser, Met, Trp, Arg, Phe, Pro, His,
Ile, Tyr, or Cys;

Xaa at position 109 is Ala, Met, Glu, His, Ser, Pro, Tyr, /or Leu;

5 which can additionally have Met- or Met-Ala- preceding the amino acid in position 1; and wherein from 4 to 35 of the amino acids designated by Xaa are different from the corresponding amino acids of native human interleukin-3.

10 10. A (15-125)human interleukin-3 mutant polypeptide
according to Claim 7 of the Formula VIII:

Asn Cys Xaa Xaa Met Ile Asp Glu Xaa Ile Xaa/Xaa Leu Lys Xaa

1 5 10 15

15

Xaa Pro Xaa Pro Xaa Xaa Asp Phe Xaa Asn/Leu Asn Xaa Glu Asp

20 25 ~~30~~

Xaa Xaa Ile Leu Met Xaa Xaa Asn Leu Arg Xaa Xaa Asn Leu Glu

20

35 40 / 45

Ala Phe Xaa Arg Xaa Xaa Lys Xaa Xaa Xaa Asn Ala Ser Ala Ile

50 55 60

25

Glu Xaa Xaa Leu Xaa Xaa Leu Xaa Pro Cys Leu Pro Xaa Xaa Thr

65 70 / 75

Ala Xaa Pro Xaa Arg Xaa Pro Ile Xaa Xaa Xaa Xaa Gly Asp Trp

80 85 / 90

30

Xaa Glu Phe Xaa Xaa Lys Leu Xaa Phe Tyr Leu Xaa Xaa Leu Glu

95 ~~100~~ 105

Xaa Xaa Xaa Xaa Gln Gln [SEQ ID NO:22]

35

170

wherein

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- Xaa at position 3 is Ser, Gly, Asp, or Gln;
Xaa at position 4 is Asn, His, or Ile;
Xaa at position 9 is Ile, Ala, Leu, or Gly;
Xaa at position 11 is Thr, His, or Gln;
5 Xaa at position 12 is His or Ala;
Xaa at position 15 is Gln or Asn;
Xaa at position 16 is Pro or Gly;
Xaa at position 18 is Leu, Arg, Asn, or Ala;
Xaa at position 20 is Leu, Val, Ser, Ala, Arg, Gln, Glu, Ile,
10 Phe, Thr or Met;
Xaa at position 21 is Leu, Ala, Asn, or Pro;
Xaa at position 24 is Asn or Ala;
Xaa at position 28 is Gly, Asp, Ser, Ala, Asn, Ile, Leu, Met,
Tyr or Arg;
15 Xaa at position 31 is Gln, Val, Met, Leu, Ala, Asn, Glu or Lys;
Xaa at position 32 is Asp, Phe, Ser, Ala, Gln, Glu, His, Val
or Thr;
Xaa at position 36 is Glu, Asn, Ser or Asp;
Xaa at position 37 is Asn, Arg, Pro, Thr, or His;
20 Xaa at position 41 is Arg, Leu, or Gly;
Xaa at position 42 is Pro, Gly, Ser, Ala, Asn, Val, Leu or Gln;
Xaa at position 48 is Asn, Pro, or Thr;
Xaa at position 50 is Ala or Asn;
Xaa at position 51 is Val or Thr;
25 Xaa at position 53 is Ser or Phe;
Xaa at position 54 is Leu or Phe;
Xaa at position 55 is Gln, Ala, Glu, or Arg;
Xaa at position 62 is Ser, Val, Asn, Pro, or Gly;
Xaa at position 63 is Ile or Leu;
30 Xaa at position 65 is Lys, Asn, Met, Arg, Ile, or Gly;
Xaa at position 66 is Asn, Gly, Glu, or Arg;
Xaa at position 68 is Leu, Gln, Trp, Arg, Asp, Asn, Glu, His,
Met, Phe, Ser, Thr, Tyr or Val;
Xaa at position 73 is Leu or Ser;
35 Xaa at position 74 is Ala or Trp;
Xaa at position 77 is Ala or Pro;

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- Xaa at position 79 is Thr, Asp, or Ala;
Xaa at position 81 is His, Pro, Arg, Val, Gly, Asn, Ser or Thr;
Xaa at position 84 is His, Ile, Asn, Ala, Thr, Arg, Gln, Glu,
Lys, Met, Ser, Tyr, Val or Leu;
- 5 Xaa at position 85 is Ile or Leu;
Xaa at position 86 is Lys or Arg;
Xaa at position 87 is Asp, Pro, Met, Lys, His, Pro, Asn, Ile, Leu
or Tyr;
- Xaa at position 91 is Asn, Pro, Ser, Ile or Asp;
- 10 Xaa at position 94 is Arg, Ala, or Ser;
Xaa at position 95 is Arg, Thr, Glu, Leu, or Ser;
Xaa at position 98 is Thr or Gln;
Xaa at position 102 is Lys, Val, Trp, or Ile;
Xaa at position 103 is Thr, Ala, His, Phe, Tyr or Ser;
- 15 Xaa at position 106 is Asn, Pro, Leu, His, Val, or Gln;
Xaa at position 107 is Ala, Ser, Ile, Pro, or Asp;
Xaa at position 108 is Gln, Met, Trp, Phe, Pro, His, Ile, or Tyr;
Xaa at position 109 is Ala, Met, Glu, Ser, or Leu;
- 20 and which can additionally have Met- or Met-Ala- preceding the
amino acid in position 1; and wherein from 4 to 26 of the amino
acids designated by Xaa are different from the corresponding
amino acids of native (1-133)human interleukin-3; or a
polypeptide having substantially the same structure and
- 25 substantially the same biological activity.
11. A (15-125) human interleukin-3 mutant
polypeptide of claim 7 wherein:
- 30 Xaa at position 17 is Ser, Lys, Asp, Met, Gln, or Arg;
Xaa at position 18 is Asn, His, Leu, Ile, Phe, Arg, or Gln;
Xaa at position 19 is Met, Arg, Gly, Ala, or Cys;
Xaa at position 20 is Ile, Cys, Gln, Glu, Arg, Pro, or Ala;
Xaa at position 21 is Asp, Phe, Lys, Arg, Ala, Gly, or Val;
- 35 Xaa at position 22 is Glu, Trp, Pro, Ser, Ala, His, or Gly;
Xaa at position 23 is Ile, Ala, Gly, Trp, Lys, Leu, Ser, or Arg;

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Xaa at position 24 is Ile, Gly, Arg, or Ser;
Xaa at position 25 is Thr, His, Gly, Gln, Arg, Pro, or Ala;
Xaa at position 26 is His, Thr, Phe, Gly, Ala, or Trp;
Xaa at position 27 is Leu, Gly, Arg, Thr, Ser, or Ala;
5 Xaa at position 28 is Lys, Leu, Gln, Gly, Pro, Val or Trp;
Xaa at position 29 is Gln, Asn, Loh, Pro, Arg, or Val;
Xaa at position 30 is Pro, His, Thr, Gly, Asp, Gln, Ser, Leu, or
Lys;
Xaa at position 31 is Pro, Asp, Gly, Arg, Leu, or Gln;
10 Xaa at position 32 is Leu, Arg, Gln, Asn, Gly, Ala, or Glu;
Xaa at position 33 is Pro, Leu, Gln, Thr, or Glu;
Xaa at position 34 is Leu, Gly, Ser, or Lys;
Xaa at position 35 is Leu, Ala, Gly, Asn, Pro, or Gln;
Xaa at position 36 is Asp, Leu, or Val;
15 Xaa at position 37 is Phe, Ser, or Pro;
Xaa at position 38 is Asn, or Ala;
Xaa at position 40 is Leu, Trp, or Arg;
Xaa at position 41 is Asn, Cys, Arg, Leu, His, Met, Pro;
Xaa at position 42 is Gly, Asp, Ser, Cys, or Ala;
20 Xaa at position 42 is Glu, Asn, Tyr, Leu, Phe, Asp, Ala, Cys, or
Ser;
Xaa at position 44 is Asp, Ser, Leu, Arg, Lys, Thr, Met, Trp, or
Pro;
Xaa at position 45 is Gln, Pro, Phe, Val, Met, Leu, Thr, Lys, or
25 Trp;
Xaa at position 46 is Asp, Phe, Ser, Thr, Cys, or Gly;
Xaa at position 47 is Ile, Gly, Ser, Arg, Pro, or His;
Xaa at position 48 is Leu, Ser, Cys, Arg, His, Phe, or Asn;
Xaa at position 49 is Met, Arg, Ala, Gly, Pro, Asn, His, or Asp;
30 Xaa at position 50 is Glu, Leu, Thr, Asp, or Tyr;
Xaa at position 51 is Asn, Arg, Met, Pro, Ser, Thr, or His;
Xaa at position 52 is Asn, His, Arg, Leu, Gly, Ser, or Thr;
Xaa at position 53 is Leu, Thr, Ala, Gly, Glu, Pro, Lys, Ser, or;
Xaa at position 54 is Arg, Asp, Ile, Ser, Val, Thr, Gln, or Leu;
35 Xaa at position 55 is Arg, Thr, Val, Ser, Leu, or Gly;
Xaa at position 56 is Pro, Gly, Cys, Ser, Gln, or Lys;

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- Xaa at position 57 is Asn or Gly;
Xaa at position 58 is Leu, Ser, Asp, Arg, Gln, Val, or Cys;
Xaa at position 59 is Glu Tyr, His, Leu, Pro, or Arg;
Xaa at position 60 is Ala, Ser, Tyr, Asn, or Thr;
5 Xaa at position 61 is Phe, Asn, Glu, Pro, Lys, Arg, or Ser;
Xaa at position 62 is Asn His, Val, Arg, Pro, Thr, or Ile;
Xaa at position 63 is Arg, Tyr, Trp, Ser, Pro, or Val;
Xaa at position 64 is Ala, Asn, Ser, or Lys;
Xaa at position 65 is Val, Thr, Pro, His, Leu, Phe, or Ser;
10 Xaa at position 66 is Lys, Ile, Val, Asn, Glu, or Ser;
Xaa at position 67 is Ser, Ala, Phe, Val, Gly, Asn, Ile, Pro, or His;
Xaa at position 68 is Leu, Val, Trp, Ser, Thr, or His;
Xaa at position 69 is Gln, Ala, Pro, Thr, Arg, Trp, Gly, or Leu;
15 Xaa at position 70 is Asn, Leu, Val, Trp, Pro, or Ala;
Xaa at position 71 is Ala, Met, Leu, Arg, Glu, Thr, Gln, Trp, or Asn;
Xaa at position 72 is Ser, Glu, Met, Ala, His, Asn, Arg, or Asp;
Xaa at position 73 is Ala, Glu, Asp, Leu, Ser, Gly, Thr, or Arg;
20 Xaa at position 74 is Ile, Thr, Pro, Arg, Gly, Ala;
Xaa at position 75 is Glu, Lys, Gly, Asp, Pro, Trp, Arg, Ser, or Leu;
Xaa at position 76 is Ser, Val, Ala, Asn, Trp, Glu, Pro, Gly, or Asp;
25 Xaa at position 77 is Ile, Ser, Arg, or Thr;
Xaa at position 78 is Leu, Ala, Ser, Glu, Gly, or Arg;
Xaa at position 79 is Lys, Thr, Gly, Asn, Met, Ile, or Asp;
Xaa at position 80 is Asn, Trp, Val, Gly, Thr, Leu, or Arg;
30 Xaa at position 81 is Leu, Gln, Gly, Ala, Trp, Arg, or Lys;
Xaa at position 82 is Leu, Gln, Lys, Trp, Arg, or Asp;
Xaa at position 83 is Pro, Thr, Trp, Arg, or Met;
Xaa at position 84 is Cys, Glu, Gly, Arg, Met, or Val;
Xaa at position 85 is Leu, Asn, or Gln;
35 Xaa at position 86 is Pro, Cys, Arg, Ala, or Lys;
Xaa at position 87 is Leu, Ser, Trp, or Gly;

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- Xaa at position 88 is Ala, Lys, Arg, Val, or Trp;
 Xaa at position 89 is Thr, Asp, Cys, Leu, Val, Glu, His, or Asn;
 Xaa at position 90 is Ala, Ser, Asp, Ile, or Met;
 Xaa at position 91 is Ala, Ser, Thr, Phe, Leu, Asp, or His;
 5 Xaa at position 92 is Pro, Phe, Arg, Ser, Lys, His, or Leu;
 Xaa at position 93 is Thr, Asp, Ser, Asn, Pro, Ala, Leu, or Arg;
 Xaa at position 94 is Arg, Ile, Ser, Glu, Leu, Val, or Pro;
 Xaa at position 95 is His, Gln, Pro, Val, Leu, Thr or Tyr;
 Xaa at position 96 is Pro, Lys, Tyr, Gly, Ile, or Thr;
 10 Xaa at position 97 is Ile, Lys, Ala, or Asn;
 Xaa at position 98 is His, Ile, Asn, Leu, Asp, Ala, Thr, or Pro;
 Xaa at position 99 is Ile, Arg, Asp, Pro, Gln, Gly, Phe, or His;
 Xaa at position 100 is Lys, Tyr, Leu, His, Ile, Ser, Gln, or Pro;
 Xaa at position 101 is Asp, Pro, Met, Lys, His, Thr, Val, Tyr, or
 15 Gln;
 Xaa at position 102 is Gly, Leu, Glu, Lys, Ser, Tyr, or Pro;
 Xaa at position 103 is Asp, or Ser;
 Xaa at position 104 is Trp, Val, Cys, Tyr, Thr, Met, Pro, Leu,
 Gln, Lys, Ala, Phe, or Gly;
 20 Xaa at position 105 is Asn, Pro, Ala, Phe, Ser, Trp, Gln, Tyr,
 Leu, Lys, Ile, or His;
 Xaa at position 106 is Glu, Ser, Ala, Lys, Thr, Ile, Gly, or Pro;
 Xaa at position 108 is Arg, Asp, Leu, Thr, Ile, or Pro;
 Xaa at position 109 is Arg, Thr, Pro, Glu, Tyr, Leu, Ser, or Gly.

25

12. The human interleukin-3 mutant polypeptide of
 claim 7:

wherein;

- 30 Xaa at position 28 is Gly, Asp, Ser, Ile, Leu, Met, Tyr, or Ala;
 Xaa at position 31 is Gln, Val, Met or Asn;
 Xaa at position 32 is Asp, Ser, Ala, Gln, His or Val;
 Xaa at position 36 is Glu or Asp;
 Xaa at position 37 is Asn, Pro or Thr;
 35 Xaa at position 48 is Asn or Pro;
 Xaa at position 62 is Ser, or Pro;

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Xaa at position 68 is Leu, Trp, Asp, Asn Glu, His, Phe, Ser or Tyr;

Xaa at position 81 is His, Arg, Thr, Asn or Ser;

Xaa at position 84 is His, Ile, Leu, Ala, Arg, Gln, Lys, Met,

5 Ser,

Tyr or Val;

Xaa at position 86 is Lys or Arg;

Xaa at position 87 is Asp, Pro, His, Asn, Ile or Leu;

Xaa at position 91 is Asn, or Pro;

10 Xaa at position 94 is Arg, Ala, or Ser;

Xaa at position 102 is Lys, Val, Trp, Ala, His, Phe, or Tyr;

Xaa at position 107 is Ala, or Ile;

Xaa at position 108 is Gln, or Ile; and

Xaa at position 109 is Ala, Met or Glu.

15

13. A polypeptide of the formula

	1		5		10
	(Met) _m -Ala	Pro	Met	Thr	Gln Thr Thr Ser Leu Lys Thr
20		15		20	
	Ser Trp Val Asn Cys Ser Xaa	Xaa Xaa Asp Glu Ile Ile			
25		30		35	
	Xaa His Leu Lys Xaa Pro Pro Xaa Pro Xaa Leu Asp Xaa				
	40	45	50		
25	Xaa Asn Leu Asn Xaa Glu Asp Xaa Asp Ile Leu Xaa Glu				
	55	60			
	Xaa Asn Leu Arg Xaa Xaa Asn Leu Xaa Xaa Phe Xaa Xaa				
	65	70	75		
	Ala Xaa Lys Xaa Leu Xaa Asn Ala Ser Xaa Ile Glu Xaa				
30		80	85		
	Ile Leu Xaa Asn Leu Xaa Pro Cys Xaa Pro Xaa Xaa Thr				
	90	95	100		
	Ala Xaa Pro Xaa Arg Xaa Pro Ile Xaa Ile Xaa Xaa Gly				
	105	110	115		
35	Asp Trp Xaa Glu Phe Arg Xaa Lys Leu Xaa Phe Tyr Leu				
	120	125			

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Xaa Xaa Leu Glu Xaa Ala Gln Xaa Gln Gln Thr Thr Leu¹
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Ser Leu Ala Ile Phe [SEQ ID NO:129]

- 5 wherein m is 0 or 1; Xaa at position 18 is Asn or Ile;
Xaa at position 19 is Met, Ala or Ile; Xaa at position
20 is Ile, Pro or Ile; Xaa at position 23 is Ile, Ala
or Leu; Xaa at position 25 is Thr or His; Xaa at
position 29 is Gln, Arg, Val or Ile; Xaa at position
10 32 is Leu, Ala, Asn or Arg; Xaa at position 34 is Leu
or Ser; Xaa at position 37 is Phe, Pro, or Ser; Xaa at
position 38 is Asn or Ala; Xaa at position 42 is Gly,
Ala, Ser, Asp or Asn; Xaa at position 45 is Gln, Val,
or Met; Xaa at position 46 is Asp or Ser; Xaa at
15 position 49 is Met, Ile, Leu or Asp; Xaa at position
50 is Glu or Asp; Xaa at position 51 is Asn Arg or
Ser; Xaa at position 55 is Arg, Leu, or Thr; Xaa at
position 56 is Pro or Ser; Xaa at position 59 is Glu
or Leu; Xaa at position 60 is Ala or Ser; Xaa at
20 position 62 is Asn, Val or Pro; Xaa at position 63 is
Arg or His; Xaa at position 65 is Val or Ser; Xaa at
position 67 is Ser, Asn, His or Gln; Xaa at position
69 is Gln or Glu; Xaa at position 73 is Ala or Gly;
Xaa at position 76 is Ser, Ala or Pro; Xaa at position
25 79 is Lys, Arg or Ser; Xaa at position 82 is Leu, Glu,
Val or Trp; Xaa at position 85 is Leu or Val; Xaa at
position 87 is Leu, Ser, Tyr; Xaa at position 88 is
Ala or Trp; Xaa at position 91 is Ala or Pro; Xaa at
position 93 is Pro or Ser; Xaa at position 95 is His
or Thr; Xaa at position 98 is His, Ile, or Thr; Xaa at
30 position 100 is Lys or Arg; Xaa at position 101 is
Asp, Ala or Met; Xaa at position 105 is Asn or Glu;
Xaa at position 109 is Arg, Glu or Leu; Xaa at
position 112 is Thr or Gln; Xaa at position 116 is
35 Lys, Val, Trp or Ser; Xaa at position 117 is Thr or
Ser; Xaa at position 120 is Asn, Gln, or His; Xaa at

position 123 is Ala or Glu; with the proviso that from four to forty-four of the amino acids designated by Xaa are different from the corresponding amino acids of native human interleukin-3; or a polypeptide having
5 substantially the same structure and substantially the same biological activity.

14. A polypeptide according to Claim 13 wherein Xaa at position 18 is Ile; Xaa at position 19
10 is Ala, or Ile; Xaa at position 20 is Pro, or Leu; Xaa at position 23 is Ala, or Leu; Xaa at position 25 is His; Xaa at position 29 is Arg, Val, or Ile; Xaa at position 32 is Ala, Asn or Arg; Xaa at position 34 is Ser; Xaa at position 37 is Pro or Ser; Xaa at position
15 38 is Ala; Xaa at position 42 is Ala, Ser, Asp, or Asn; and Xaa at position 45 is Val or Met; Xaa at position 46 is Ser.

15. A polypeptide according to Claim 13
20 wherein Xaa at position 49 is Ile, or Leu, or Asp; Xaa at position 50 is Asp; Xaa at position 51 is Arg or Ser; Xaa at position 55 is Leu or Thr; Xaa at position 56 is Ser; Xaa at position 59 is Glu or Leu; Xaa at position 60 is Ala or Ser; Xaa at position 62 is Val,
25 or Pro; Xaa at position 63 is His; Xaa at position 65 is Ser; Xaa at position 67 is Asn, or His, or Gln; and Xaa at position 69 is Glu.

30 16. A polypeptide according to Claim 13 wherein Xaa at position 73 is Gly; Xaa at position 76 is Ala, or Pro; Xaa at position 79 is Arg, or Ser; Xaa at position 82 is Gln or Val, or Trp; Xaa at position 85 is Val; Xaa at position 87 is Ser, or Tyr; Xaa at
35 position 88 is Trp; Xaa at position 91 is Pro; Xaa at position 93 is Ser; Xaa at position 95 is Thr; Xaa at

position 98 is Ile or Thr; Xaa at position 100 is Arg; Xaa at position 101 is Ala, or Met; and Xaa at position 105 is Glu.

5 17. A polypeptide according to Claim 13
wherein Xaa at position 109 is Glu, or Leu; Xaa at
position 112 is Gln; Xaa at position 116 is Val, or
Trp, or Ser; Xaa at position 117 is Ser; Xaa at
position 120 is Glu or His; and Xaa at position 123 is
10 Glu.

 18. A polypeptide according to Claim 13
wherein Xaa at position 18 is Ile; Xaa at position 19
is Ala, or Ile; Xaa at position 20 is Pro, or Leu; Xaa
15 at position 23 is Ala, or Leu; Xaa at position 25 is
His; Xaa at position 29 is Arg or Val, or Ile; Xaa at
position 32 is Ala or Asn, or Arg; Xaa at position 34
is Ser; Xaa at position 37 is Pro or Ser; Xaa at
position 38 is Ala; Xaa at position 42 is Ala or Ser,
20 Asp or Asn; Xaa at position 45 is Val or Met; Xaa at
position 46 is Ser; Xaa at position 49 is Ile, or Leu,
or Asp; Xaa at position 50 is Asp; Xaa at position 51
is Arg, or Ser; Xaa at position 55 is Leu or Thr; Xaa
at position 56 is Ser; Xaa at position 59 is Glu or
25 Leu; Xaa at position 60 is Ala or Ser; Xaa at position
62 is Val, or Pro; Xaa at position 63 is His; Xaa at
position 65 is Ser; Xaa at position 67 is Asn, or His,
or Gln; and Xaa at position 69 is Glu.

30 19. A polypeptide according to Claim 13
wherein Xaa at position 73 is Gly; Xaa at position 76
is Ala, or Pro; Xaa at position 79 is Arg, or Ser; Xaa
at position 82 is Gln or Val, or Trp; Xaa at position
85 is Val; Xaa at position 87 is Ser, or Tyr; Xaa at
35 position 88 is Trp; Xaa at position 91 is Pro; Xaa at
position 93 is Ser; Xaa at position 95 is Thr; Xaa at

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position 98 is Ile or Thr; Xaa at position 100 is Arg;
 Xaa at position 101 is Ala, or Met; Xaa at position
 105 is Glu; Xaa at position 109 is Glu, or Leu; Xaa at
 position 112 is Gln; Xaa at position 116 is Val, or
 5 Trp, or Ser; Xaa at position 117 is Ser; Xaa at
 position 120 is Glu or His; and Xaa at position 123 is
 Glu.

20. A polypeptide of the formula

10 1 5 10
 (Met_m-Ala_n)_p-Asn Cys Ser Xaa Xaa Xaa Asp Glu Xaa Ile
 15 20
 Xaa His Leu Lys Xaa Pro Pro Xaa Pro Xaa Leu Asp Xaa
 15 25 30 35
 Xaa Asn Leu Asn Xaa Glu Asp Xaa Xaa Ile Leu Xaa Glu
 40 45
 Xaa Asn Leu Arg Xaa Xaa Asn Leu Xaa Xaa Phe Xaa Xaa
 50 55 60
 20 Ala Xaa Lys Xaa Leu Xaa Asn Ala Ser Xaa Ile Glu Xaa
 65 70 75
 Ile Leu Xaa Asn Xaa Xaa Pro Cys Xaa Pro Xaa Ala Thr
 80 85
 Ala Xaa Pro Xaa Arg Xaa Pro Ile Xaa Ile Xaa Xaa Gly
 25 90 95 100
 Asp Trp Xaa Glu Phe Arg Xaa Lys Leu Xaa Phe Tyr Leu
 105 110
 Xaa Xaa Leu Glu Xaa Ala Gln Xaa Gln Gln [SEQ ID
 NO:130]

30 wherein m is 0 or 1; n is 0 or 1; p is 0 or 1; Xaa at
 position 4 is Asn or Ile; Xaa at position 5 is Met,
 Ala or Ile; Xaa at position 6 is Ile, Pro or Leu; Xaa
 at position 9 is Ile, Ala or Leu; Xaa at position 11
 35 is Thr or His; Xaa at position 15 is Gln, Arg, Val or
 Ile; Xaa at position 18 is Leu, Ala, Asn or Arg; Xaa

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at position 20 is Leu or Ser; Xaa at position 23 is Phe, Pro, or Ser; Xaa at position 24 is Asn or Ala; Xaa at position 28 is Gly, Ala, Ser, Asp or Asn; Xaa at position 31 is Gln, Val, or Met; Xaa at position 32 is Asp or Ser; Xaa at position 35 is Met, Ile or Asp; Xaa at position 36 is Glu or Asp; Xaa at position 37 is Asn, Arg or Ser; Xaa at position 41 is Arg, Leu, or Thr; Xaa at position 42 is Pro or Ser; Xaa at position 45 is Glu or Leu; Xaa at position 46 is Ala or Ser; Xaa at position 48 is Asn, Val or Pro; Xaa at position 49 is Arg or His; Xaa at position 51 is Val or Ser; Xaa at position 53 is Ser, Asn, His or Gln; Xaa at position 55 is Gln or Glu; Xaa at position 59 is Ala or Gly; Xaa at position 62 is Ser, Ala or Pro; Xaa at position 65 is Lys, Arg or Ser; Xaa at position 67 is Leu, Glu, or Val; Xaa at position 68 is Leu, Glu, Val or Trp; Xaa at position 71 is Leu or Val; Xaa at position 73 is Leu, Ser or Tyr; Xaa at position 74 is Ala or Trp; Xaa at position 77 is Ala or Pro; Xaa at position 79 is Pro or Ser; Xaa at position 81 is His or Thr; Xaa at position 84 is His, Ile, or Thr; Xaa at position 86 is Lys or Arg; Xaa at position 87 is Asp, Ala or Met; Xaa at position 91 is Asn or Glu; Xaa at position 95 is Arg, Glu, Leu; Xaa at position 98 Thr or Gln; Xaa at position 102 is Lys, Val, Trp or Ser; Xaa at position 103 is Thr or Ser; Xaa at position 106 is Asn, Gln, or His; Xaa at position 109 is Ala or Glu; with the proviso that from four to forty-four of the amino acids designated by Xaa are different from the corresponding amino acids of native (15-125)human interleukin-3; or a polypeptide having substantially the same structure and substantially the same biological activity.

21. A polypeptide according to Claim 20 wherein Xaa at position 4 is Ile; Xaa at position 5 is

Ala, or Ile; Xaa at position 6 is Pro, or Leu; Xaa at position 9 is Ala, or Leu; Xaa at position 11 is His; Xaa at position 15 is Arg or Val, or Ile; Xaa at position 18 is Ala or Asn, or Arg; Xaa at position 20 is Ser; Xaa at position 23 is Pro or Ser; Xaa at position 24 is Ala; Xaa at position 28 is Ala or Ser, or Asp, or Asn; Xaa at position 31 is Val or Met; and Xaa at position 32 is Ser.

22. A polypeptide according to Claim 20 wherein Xaa at position 35 is Ile, or Leu, or Asp; Xaa at position 36 is Asp; Xaa at position 37 is Arg, or Ser; Xaa at position 41 is Leu or Thr; Xaa at position 42 is Ser; Xaa at position 45 is Glu or Leu; Xaa at position 46 is Ala or Ser; Xaa at position 48 is Val, or Pro; Xaa at position 49 is His; Xaa at position 51 is Ser; Xaa at position 53 is Asn, or His, or Gln; and Xaa at position 55 is Glu.

23. A polypeptide according to Claim 20 wherein Xaa at position 59 is Gly; Xaa at position 62 is Ala, or Pro; Xaa at position 65 is Arg, or Ser; Xaa at position 67 is Gln or Val; Xaa at position 68 is Glu, or Val, or Trp; Xaa at position 71 is Val; Xaa at position 73 is Ser, or Tyr; Xaa at position 74 is Trp; Xaa at position 77 is Pro; Xaa at position 79 is Ser; Xaa at position 81 is Thr; Xaa at position 84 is Ile or Thr; Xaa at position 86 is Arg; Xaa at position 87 is Ala, or Met; and Xaa at position 91 is Glu.

24. A polypeptide according to Claim 20 wherein Xaa at position 95 is Glu, or Leu; Xaa at position 98 is Gln; Xaa at position 102 is Val, or Trp, or Ser; Xaa at position 103 is Ser; Xaa at position 106 is Glu or His; and Xaa at position 109 is Glu.

25. A polypeptide according to Claim 20 wherein Xaa at position 4 is Ile; Xaa at position 5 is Ala, or Ile; Xaa at position 6 is Pro, or Leu; Xaa at position 9 is Ala, or Leu; Xaa at position 11 is His; Xaa at position 15 is Arg or Val, or Ile; Xaa at position 18 is Ala or Asn, or Arg; Xaa at position 20 is Ser; Xaa at position 23 is Pro or Ser; Xaa at position 24 is Ala; Xaa at position 28 is Ala or Ser, or Asp, or Asn; Xaa at position 31 is Val or Met; Xaa at position 32 is Ser; Xaa at position 35 is Ile, or Leu, or Asp; Xaa at position 36 is Asp; Xaa at position 37 is Arg, or Ser; Xaa at position 41 is Leu or Thr; Xaa at position 42 is Ser; Xaa at position 45 is Glu or Leu; Xaa at position 46 is Ala or Ser; Xaa at position 48 is Val, or Pro; Xaa at position 49 is His; Xaa at position 51 is Ser; Xaa at position 53 is Asn, or His, or Gln; and Xaa at position 55 is Glu.

26. A polypeptide according to Claim 20 wherein Xaa at position 59 is Gly; Xaa at position 62 is Ala, or Pro; Xaa at position 65 is Arg, or Ser; Xaa at position 67 is Gln or Val; Xaa at position 68 is Glu, or Val, or Trp; Xaa at position 71 is Val; Xaa at position 73 is Ser, or Tyr; Xaa at position 74 is Trp; Xaa at position 77 is Pro; Xaa at position 79 is Ser; Xaa at position 81 is Thr; Xaa at position 84 is Ile or Thr; Xaa at position 86 is Arg; Xaa at position 87 is Ala, or Met; Xaa at position 91 is Glu; Xaa at position 95 is Glu, or Lue; Xaa at position 98 is Gln; Xaa at position 102 is Val, or Trp, or Ser; Xaa at position 103 is Ser; Xaa at position 106 is Glu or His; and Xaa at position 109 is Glu.

27. A polypeptide according to Claim 20 which is selected from

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Asn Cys Ser Ile Met Ile Asp Glu Ile Ile His His
Leu
Lys Arg Pro Pro Ala Pro Leu Leu Asp Pro Asn Asn Leu
Asn Ala
5 Glu Asp Val Asp Ile Leu Met Glu Asn Asn Leu Arg Arg
Pro Asn
Leu Glu Ala Phe Asn Arg Ala Val Lys Ser Leu Gln Asn
Ala Ser
Ala Ile Glu Ser Ile Leu Lys Asn Leu Leu Pro Cys Leu
10 Pro Leu
Ala Thr Ala Ala Pro Thr Arg His Pro Ile His Ile Lys
Asp Gly
Asp Trp Asn Glu Phe Arg Arg Lys Leu Thr Phe Tyr Leu
Lys Thr
15 Leu Glu Asn Ala Gln Ala Gln Gln [SEQ ID NO:66];

Asn Cys Ser Ile Met Ile Asp Glu Ile Ile His His
Leu Lys
Arg Pro Pro Asn Pro Leu Leu Asp Pro Asn Asn Leu Asn
20 Ser Glu
Asp Met Asp Ile Leu Met Glu Asn Asn Leu Arg Arg Pro
Asn Leu
Glu Ala Phe Asn Arg Ala Val Lys Ser Leu Gln Asn Ala
Ser Ala
25 Ile Glu Ser Ile Leu Lys Asn Leu Leu Pro Cys Leu Pro
Leu Ala
Thr Ala Ala Pro Thr Arg His Pro Ile His Ile Lys Asp
Gly Asp
Trp Asn Glu Phe Arg Arg Lys Leu Thr Phe Tyr Leu Lys
30 Thr Leu
Glu Asn Ala Gln Ala Gln Gln [SEQ ID NO:67];

Asn Cys Ser Ile Met Ile Asp Glu Ile Ile His His
Leu Lys
35 Val Pro Pro Ala Pro Leu Leu Asp Ser Asn Asn Leu Asn
Ser Glu

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Asp Met Asp Ile Leu Met Glu Asn Asn Leu Arg Arg Pro
Asn Leu
Glu Ala Phe Asn Arg Ala Val Lys Ser Leu Gln Asn Ala
Ser Ala
5 Ile Glu Ser Ile Leu Lys Asn Leu Leu Pro Cys Leu Pro
Leu Ala
Thr Ala Ala Pro Thr Arg His Pro Ile His Ile Lys Asp
Gly Asp
Trp Asn Glu Phe Arg Arg Lys Leu Thr Phe Tyr Leu Lys
10 Thr Leu
Glu Asn Ala Gln Ala Gln Gln [SEQ ID NO:68];

Asn Cys Ser Asn Met Ile Asp Glu Ile Ile Thr His
Leu Lys
15 Gln Pro Pro Leu Pro Leu Leu Asp Phe Asn Asn Leu Asn
Gly Glu
Asp Gln Asp Ile Leu Met Glu Arg Asn Leu Arg Leu Pro
Asn Leu
Leu Ala Phe Val Arg Ala Val Lys Asn Leu Glu Asn Ala
20 Ser Ala
Ile Glu Ser Ile Leu Lys Asn Leu Leu Pro Cys Leu Pro
Leu Ala
Thr Ala Ala Pro Thr Arg His Pro Ile His Ile Lys Asp
Gly Asp
25 Trp Asn Glu Phe Arg Arg Lys Leu Thr Phe Tyr Leu Lys
Thr Leu
Glu Asn Ala Gln Ala Gln Gln [SEQ ID NO:69];

Asn Cys Ser Asn Met Ile Asp Glu Ile Ile Thr His
30 Leu Lys
Gln Pro Pro Leu Pro Leu Leu Asp Phe Asn Asn Leu Asn
Gly Glu
Asp Gln Asp Ile Leu Met Glu Arg Asn Leu Arg Leu Pro
Asn Leu
35 Glu Ser Phe Val Arg Ala Val Lys Asn Leu Glu Asn Ala
Ser Ala

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Ile Glu Ser Ile Leu Lys Asn Leu Leu Pro Cys Leu Pro
Leu Ala
Thr Ala Ala Pro Thr Arg His Pro Ile His Ile Lys Asp
Gly Asp
5 Trp Asn Glu Phe Arg Arg Lys Leu Thr Phe Tyr Leu Lys
Thr Leu
Glu Asn Ala Gln Ala Gln Gln [SEQ ID NO:70];

Asn Cys Ser Asn Met Ile Asp Glu Ile Ile Thr His
10 Leu Lys
Gln Pro Pro Leu Pro Leu Leu Asp Phe Asn Asn Leu Asn
Gly Glu
Asp Gln Asp Ile Leu Met Glu Arg Asn Leu Arg Thr Pro
Asn Leu
15 Leu Ala Phe Val Arg Ala Val Lys His Leu Glu Asn Ala
Ser Ala
Ile Glu Ser Ile Leu Lys Asn Leu Leu Pro Cys Leu Pro
Leu Ala
Thr Ala Ala Pro Thr Arg His Pro Ile His Ile Lys Asp
20 Gly Asp
Trp Asn Glu Phe Arg Arg Lys Leu Thr Phe Tyr Leu Lys
Thr Leu
Glu Asn Ala Gln Ala Gln Gln [SEQ ID NO:71];

25 Asn Cys Ser Asn Met Ile Asp Glu Ile Ile Thr His
Leu Lys
Gln Pro Pro Leu Pro Leu Leu Asp Phe Asn Asn Leu Asn
Gly Glu
Asp Gln Asp Ile Leu Met Glu Asn Asn Leu Arg Arg Pro
30 Asn Leu
Glu Ala Phe Asn Arg Ala Val Lys Ser Leu Gln Asn Ala
Ser Gly
Ile Glu Ala Ile Leu Arg Asn Leu Gln Pro Cys Leu Pro
Ser Ala
35 Thr Ala Ala Pro Ser Arg His Pro Ile Ile Ile Lys Ala
Gly Asp

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Trp Gln Glu Phe Arg Arg Lys Leu Thr Phe Tyr Leu Lys
Thr Leu
Glu Asn Ala Gln Ala Gln Gln [SEQ ID NO:72];

5 Asn Cys Ser Asn Met Ile Asp Glu Ile Ile Thr His
Leu Lys
Gln Pro Pro Leu Pro Leu Leu Asp Phe Asn Asn Leu Asn
Gly Glu
Asp Gln Asp Ile Leu Met Glu Asn Asn Leu Arg Arg Pro
10 Asn Leu
Glu Ala Phe Asn Arg Ala Val Lys Ser Leu Gln Asn Ala
Ser Gly
Ile Glu Ala Ile Leu Arg Asn Leu Val Pro Cys Leu Pro
Ser Ala
15 Thr Ala Ala Pro Ser Arg His Pro Ile Thr Ile Lys Ala
Gly Asp
Trp Gln Glu Phe Arg Arg Lys Leu Thr Phe Tyr Leu Lys
Thr Leu
Glu Asn Ala Gln Ala Gln Gln [SEQ ID NO:73];

20 Asn Cys Ser Asn Met Ile Asp Glu Ile Ile Thr His
Leu Lys
Gln Pro Pro Leu Pro Leu Leu Asp Phe Asn Asn Leu Asn
Gly Glu
25 Asp Gln Asp Ile Leu Met Glu Asn Asn Leu Arg Arg Pro
Asn Leu
Glu Ala Phe Asn Arg Ala Val Lys Ser Leu Gln Asn Ala
Ser Ala
Ile Glu Ser Ile Leu Lys Asn Leu Leu Pro Cys Leu Pro
30 Leu Ala
Thr Ala Ala Pro Thr Arg His Pro Ile His Ile Lys Asp
Gly Asp
Trp Asn Glu Phe Arg Glu Lys Leu Thr Phe Tyr Leu Val
Thr Leu
35 Glu Gln Ala Gln Glu Gln Gln [SEQ ID NO:74];

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Asn Cys Ser Asn Met Ile Asp Glu Ile Ile Thr His
Leu Lys
Gln Pro Pro Leu Pro Leu Leu Asp Phe Asn Asn Leu Asn
Gly Glu
5 Asp Gln Asp Ile Leu Met Glu Asn Asn Leu Arg Arg Pro
Asn Leu
Glu Ala Phe Asn Arg Ala Val Lys Ser Leu Gln Asn Ala
Ser Ala
Ile Glu Ser Ile Leu Lys Asn Leu Leu Pro Cys Leu Pro
10 Leu Ala
Thr Ala Ala Pro Thr Arg His Pro Ile His Ile Lys Asp
Gly Asp
Trp Asn Glu Phe Arg Glu Lys Leu Thr Phe Tyr Leu Val
Ser Leu
15 Glu His Ala Gln Glu Gln Gln [SEQ ID NO:75];

Asn Cys Ser Asn Met Ile Asp Glu Ile Ile Thr His
Leu Lys
Gln Pro Pro Leu Pro Leu Leu Asp Phe Asn Asn Leu Asn
20 Gly Glu
Asp Gln Asp Ile Leu Met Glu Asn Asn Leu Arg Arg Pro
Asn Leu
Glu Ala Phe Asn Arg Ala Val Lys Ser Leu Gln Asn Ala
Ser Gly
25 Ile Glu Ala Ile Leu Arg Asn Leu Gln Pro Cys Leu Pro
Ser Ala
Thr Ala Ala Pro Ser Arg His Pro Ile Ile Ile Lys Ala
Gly Asp
Trp Gln Glu Phe Arg Glu Lys Leu Thr Phe Tyr Leu Val
30 Thr Leu
Glu Gln Ala Gln Glu Gln Gln [SEQ ID NO:76];

Asn Cys Ser Asn Met Ile Asp Glu Ile Ile Thr His
Leu Lys
35 Gln Pro Pro Leu Pro Leu Leu Asp Phe Asn Asn Leu Asn
Gly Glu

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Asp Gln Asp Ile Leu Met Glu Asn Asn Leu Arg Arg Pro
Asn Leu
Glu Ala Phe Asn Arg Ala Val Lys Ser Leu Gln Asn Ala
Ser Gly
5 Ile Glu Ala Ile Leu Arg Asn Leu Val Pro Cys Leu Pro
Ser Ala
Thr Ala Ala Pro Ser Arg His Pro Ile Thr Ile Lys Ala
Gly Asp
Trp Gln Glu Phe Arg Glu Lys Leu Thr Phe Tyr Leu Val
10 Thr Leu
Glu Gln Ala Gln Glu Gln Gln [SEQ ID NO:77];

Asn Cys Ser Asn Met Ile Asp Glu Ile Ile Thr His
Leu Lys
15 Gln Pro Pro Leu Pro Leu Leu Asp Phe Asn Asn Leu Asn
Gly Glu
Asp Gln Asp Ile Leu Met Glu Asn Asn Leu Arg Arg Pro
Asn Leu
Glu Ala Phe Asn Arg Ala Val Lys Ser Leu Gln Asn Ala
20 Ser Gly
Ile Glu Ala Ile Leu Arg Asn Leu Val Pro Cys Leu Pro
Ser Ala
Thr Ala Ala Pro Ser Arg His Pro Ile Thr Ile Lys Ala
Gly Asp
25 Trp Gln Glu Phe Arg Glu Lys Leu Thr Phe Tyr Leu Val
Ser Leu
Glu His Ala Gln Glu Gln Gln [SEQ ID NO:78];

Asn Cys Ser Ile Met Ile Asp Glu Ile Ile His His
30 Leu Lys
Arg Pro Pro Ala Pro Leu Leu Asp Pro Asn Asn Leu Asn
Ala Glu
Asp Val Asp Ile Leu Met Glu Arg Asn Leu Arg Leu Pro
Asn Leu
35 Glu Ser Phe Val Arg Ala Val Lys Asn Leu Glu Asn Ala
Ser Ala

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Ile Glu Ser Ile Leu Lys Asn Leu Leu Pro Cys Leu Pro
Leu Ala
Thr Ala Ala Pro Thr Arg His Pro Ile His Ile Lys Asp
Gly Asp
5 Trp Asn Glu Phe Arg Arg Lys Leu Thr Phe Tyr Leu Lys
Thr Leu
Glu Asn Ala Gln Ala Gln Gln [SEQ ID NO:79];

Asn Cys Ser Ile Met Ile Asp Glu Ile Ile His His
10 Leu Lys
Arg Pro Pro Asn Pro Leu Leu Asp Pro Asn Asn Leu Asn
Ser Glu
Asp Met Asp Ile Leu Met Glu Arg Asn Leu Arg Thr Pro
Asn Leu
15 Leu Ala Phe Val Arg Ala Val Lys His Leu Glu Asn Ala
Ser Ala
Ile Glu Ser Ile Leu Lys Asn Leu Leu Pro Cys Leu Pro
Leu Ala
Thr Ala Ala Pro Thr Arg His Pro Ile His Ile Lys Asp
20 Gly Asp
Trp Asn Glu Phe Arg Arg Lys Leu Thr Phe Tyr Leu Lys
Thr Leu
Glu Asn Ala Gln Ala Gln Gln [SEQ ID NO:80];

25 Asn Cys Ser Ile Met Ile Asp Glu Ile Ile His His
Leu Lys
Val Pro Pro Ala Pro Leu Leu Asp Ser Asn Asn Leu Asn
Ser Glu
Asp Met Asp Ile Leu Met Glu Arg Asn Leu Arg Leu Pro
30 Asn Leu
Leu Ala Phe Val Arg Ala Val Lys Asn Leu Glu Asn Ala
Ser Ala
Ile Glu Ser Ile Leu Lys Asn Leu Leu Pro Cys Leu Pro
Leu Ala
35 Thr Ala Ala Pro Thr Arg His Pro Ile His Ile Lys Asp
Gly Asp

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Trp Asn Glu Phe Arg Arg Lys Leu Thr Phe Tyr Leu Lys
Thr Leu
Glu Asn Ala Gln Ala Gln Gln [SEQ ID NO:81];

5 Met Ala Asn Cys Ser Asn Met Ile Asp Glu Ile Ile Thr
His Leu
Lys Gln Pro Pro Leu Pro Leu Leu Asp Phe Asn Asn Leu
Asn Gly
Glu Asp Gln Asp Ile Leu Met Glu Asn Asn Leu Arg Arg
10 Pro Asn
Leu Glu Ala Phe Asn Arg Ala Val Lys Ser Leu Gln Asn
Ala Ser
Gly Ile Glu Ala Ile Leu Arg Asn Leu Gln Pro Cys Leu
Pro Ser
15 Ala Thr Ala Ala Pro Ser Arg His Pro Ile Ile Ile Lys
Ala Gly
Asp Trp Gln Glu Phe Arg Glu Lys Leu Thr Phe Tyr Leu
Val Thr
Leu Glu Gln Ala Gln Glu Gln Gln [SEQ ID NO:82];

20 Met Ala Asn Cys Ser Asn Met Ile Asp Glu Ile Ile Thr
His Leu
Lys Gln Pro Pro Leu Pro Leu Leu Asp Phe Asn Asn Leu
Asn Gly
25 Glu Asp Gln Asp Ile Leu Met Glu Asn Asn Leu Arg Arg
Pro Asn
Leu Glu Ala Phe Asn Arg Ala Val Lys Ser Leu Gln Asn
Ala Ser
Gly Ile Glu Ala Ile Leu Arg Asn Leu Val Pro Cys Leu
30 Pro Ser
Ala Thr Ala Ala Pro Ser Arg His Pro Ile Thr Ile Lys
Ala Gly
Asp Trp Gln Glu Phe Arg Glu Lys Leu Thr Phe Tyr Leu
Val Thr
35 Leu Glu Gln Ala Gln Glu Gln Gln [SEQ ID NO:83];

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Met Ala Asn Cys Ser Asn Met Ile Asp Glu Ile Ile Thr
His Leu
Lys Gln Pro Pro Leu Pro Leu Leu Asp Phe Asn Asn Leu
Asn Gly
5 Glu Asp Gln Asp Ile Leu Met Glu Asn Asn Leu Arg Arg
Pro Asn
Leu Glu Ala Phe Asn Arg Ala Val Lys Ser Leu Gln Asn
Ala Ser
Gly Ile Glu Ala Ile Leu Arg Asn Leu Val Pro Cys Leu
10 Pro Ser
Ala Thr Ala Ala Pro Ser Arg His Pro Ile Thr Ile Lys
Ala Gly
Asp Trp Gln Glu Phe Arg Glu Lys Leu Thr Phe Tyr Leu
Val Ser
15 Leu Glu His Ala Gln Glu Gln Gln [SEQ ID NO:84];

Met Ala Asn Cys Ser Ile Met Ile Asp Glu Ile Ile His
His Leu
Lys Arg Pro Pro Ala Pro Leu Leu Asp Pro Asn Asn Leu
20 Asn Ala
Glu Asp Val Asp Ile Leu Met Glu Arg Asn Leu Arg Leu
Pro Asn
Leu Glu Ser Phe Val Arg Ala Val Lys Asn Leu Glu Asn
Ala Ser
25 Ala Ile Glu Ser Ile Leu Lys Asn Leu Leu Pro Cys Leu
Pro Leu
Ala Thr Ala Ala Pro Thr Arg His Pro Ile His Ile Lys
Asp Gly
Asp Trp Asn Glu Phe Arg Arg Lys Leu Thr Phe Tyr Leu
30 Lys Thr
Leu Glu Asn Ala Gln Ala Gln Gln [SEQ ID NO:85];

Met Ala Asn Cys Ser Ile Met Ile Asp Glu Ile Ile His
His Leu
35 Lys Arg Pro Pro Asn Pro Leu Leu Asp Pro Asn Asn Leu
Asn Ser

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Glu Asp Met Asp Ile Leu Met Glu Arg Asn Leu Arg Thr
Pro Asn
Leu Leu Ala Phe Val Arg Ala Val Lys His Leu Glu Asn
Ala Ser
5 Ala Ile Glu Ser Ile Leu Lys Asn Leu Leu Pro Cys Leu
Pro Leu
Ala Thr Ala Ala Pro Thr Arg His Pro Ile His Ile Lys
Asp Gly
Asp Trp Asn Glu Phe Arg Arg Lys Leu Thr Phe Tyr Leu
10 Lys Thr
Leu Glu Asn Ala Gln Ala Gln Gln [SEQ ID NO:86];

Met Ala Asn Cys Ser Ile Met Ile Asp Glu Ile Ile His
His Leu
15 Lys Val Pro Pro Ala Pro Leu Leu Asp Ser Asn Asn Leu
Asn Ser
Glu Asp Met Asp Ile Leu Met Glu Arg Asn Leu Arg Leu
Pro Asn
Leu Leu Ala Phe Val Arg Ala Val Lys Asn Leu Glu Asn
20 Ala Ser
Ala Ile Glu Ser Ile Leu Lys Asn Leu Leu Pro Cys Leu
Pro Leu
Ala Thr Ala Ala Pro Thr Arg His Pro Ile His Ile Lys
Asp Gly
25 Asp Trp Asn Glu Phe Arg Arg Lys Leu Thr Phe Tyr Leu
Lys Thr
Leu Glu Asn Ala Gln Ala Gln Gln [SEQ ID NO:87];

Met Ala Asn Cys Ser Ile Met Ile Asp Glu Ile Ile His
30 His Leu
Lys Arg Pro Pro Ala Pro Leu Leu Asp Pro Asn Asn Leu
Asn Ala
Glu Asp Val Asp Ile Leu Met Glu Arg Asn Leu Arg Leu
Pro Asn
35 Leu Glu Ser Phe Val Arg Ala Val Lys Asn Leu Glu Asn
Ala Ser

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Gly Ile Glu Ala Ile Leu Arg Asn Leu Gln Pro Cys Leu
Pro Ser
Ala Thr Ala Ala Pro Ser Arg His Pro Ile Ile Ile Lys
Ala Gly
5 Asp Trp Gln Glu Phe Arg Glu Lys Leu Thr Phe Tyr Leu
Val Thr
Leu Glu Gln Ala Gln Glu Gln Gln [SEQ ID NO:88];

Met Ala Asn Cys Ser Ile Met Ile Asp Glu Ile Ile His
10 His Leu
Lys Arg Pro Pro Asn Pro Leu Leu Asp Pro Asn Asn Leu
Asn Ser
Glu Asp Met Asp Ile Leu Met Glu Arg Asn Leu Arg Thr
Pro Asn
15 Leu Leu Ala Phe Val Arg Ala Val Lys His Leu Glu Asn
Ala Ser
Gly Ile Glu Ala Ile Leu Arg Asn Leu Gln Pro Cys Leu
Pro Ser
Ala Thr Ala Ala Pro Ser Arg His Pro Ile Ile Ile Lys
20 Ala Gly
Asp Trp Gln Glu Phe Arg Glu Lys Leu Thr Phe Tyr Leu
Val Thr
Leu Glu Gln Ala Gln Glu Gln Gln [SEQ ID NO:89];

25 Met Ala Asn Cys Ser Ile Met Ile Asp Glu Ile Ile His
His Leu
Lys Val Pro Pro Ala Pro Leu Leu Asp Ser Asn Asn Leu
Asn Ser
Glu Asp Met Asp Ile Leu Met Glu Arg Asn Leu Arg Leu
30 Pro Asn
Leu Leu Ala Phe Val Arg Ala Val Lys Asn Leu Glu Asn
Ala Ser
Gly Ile Glu Ala Ile Leu Arg Asn Leu Gln Pro Cys Leu
Pro Ser
35 Ala Thr Ala Ala Pro Ser Arg His Pro Ile Ile Ile Lys
Ala Gly

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Asp Trp Gln Glu Phe Arg Glu Lys Leu Thr Phe Tyr Leu
Val Thr
Leu Glu Gln Ala Gln Glu Gln Gln [SEQ ID NO:90];

5 Met Ala Asn Cys Ser Ile Met Ile Asp Glu Ile Ile His
His Leu
Lys Arg Pro Pro Ala Pro Leu Leu Asp Pro Asn Asn Leu
Asn Ala
Glu Asp Val Asp Ile Leu Met Glu Arg Asn Leu Arg Leu
10 Pro Asn
Leu Glu Ser Phe Val Arg Ala Val Lys Asn Leu Glu Asn
Ala Ser
Gly Ile Glu Ala Ile Leu Arg Asn Leu Val Pro Cys Leu
Pro Ser
15 Ala Thr Ala Ala Pro Ser Arg His Pro Ile Thr Ile Lys
Ala Gly
Asp Trp Gln Glu Phe Arg Glu Lys Leu Thr Phe Tyr Leu
Val Thr
Leu Glu Gln Ala Gln Glu Gln Gln [SEQ ID NO:91];

20 Met Ala Asn Cys Ser Ile Met Ile Asp Glu Ile Ile His
His Leu
Lys Val Pro Pro Ala Pro Leu Leu Asp Ser Asn Asn Leu
Asn Ser
25 Glu Asp Met Asp Ile Leu Met Glu Arg Asn Leu Arg Leu
Pro Asn
Leu Leu Ala Phe Val Arg Ala Val Lys Asn Leu Glu Asn
Ala Ser
Gly Ile Glu Ala Ile Leu Arg Asn Leu Val Pro Cys Leu
30 Pro Ser
Ala Thr Ala Ala Pro Ser Arg His Pro Ile Thr Ile Lys
Ala Gly
Asp Trp Gln Glu Phe Arg Glu Lys Leu Thr Phe Tyr Leu
Val Thr
35 Leu Glu Gln Ala Gln Glu Gln Gln [SEQ ID NO:92];

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Met Ala Asn Cys Ser Ile Met Ile Asp Glu Ile Ile His
His Leu
Lys Arg Pro Pro Asn Pro Leu Leu Asp Pro Asn Asn Leu
Asn Ser
5 Glu Asp Met Asp Ile Leu Met Glu Arg Asn Leu Arg Thr
Pro Asn
Leu Leu Ala Phe Val Arg Ala Val Lys His Leu Glu Asn
Ala Ser
Gly Ile Glu Ala Ile Leu Arg Asn Leu Val Pro Cys Leu
10 Pro Ser
Ala Thr Ala Ala Pro Ser Arg His Pro Ile Thr Ile Lys
Ala Gly
Asp Trp Gln Glu Phe Arg Glu Lys Leu Thr Phe Tyr Leu
Val Ser
15 Leu Glu His Ala Gln Glu Gln Gln [SEQ ID NO:93];

Met Ala Asn Cys Ser Ile Met Ile Asp Glu Ile Ile His
His Leu
Lys Val Pro Pro Ala Pro Leu Leu Asp Ser Asn Asn Leu
20 Asn Ser
Glu Asp Met Asp Ile Leu Met Glu Arg Asn Leu Arg Leu
Pro Asn
Leu Leu Ala Phe Val Arg Ala Val Lys Asn Leu Glu Asn
Ala Ser
25 Gly Ile Glu Ala Ile Leu Arg Asn Leu Val Pro Cys Leu
Pro Ser
Ala Thr Ala Ala Pro Ser Arg His Pro Ile Thr Ile Lys
Ala Gly
Asp Trp Gln Glu Phe Arg Glu Lys Leu Thr Phe Tyr Leu
30 Val Ser
Leu Glu His Ala Gln Glu Gln Gln [SEQ ID NO:94];

Met Ala Asn Cys Ser Ile Met Ile Asp Glu Ile Ile His
His Leu
35 Lys Arg Pro Pro Asn Pro Leu Leu Asp Pro Asn Asn Leu
Asn Ser

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Glu Asp Met Asp Ile Leu Met Glu Arg Asn Leu Arg Thr
Pro Asn
Leu Leu Ala Phe Val Arg Ala Val Lys His Leu Glu Asn
Ala Ser
5 Gly Ile Glu Ala Ile Leu Arg Asn Leu Val Pro Cys Leu
Pro Ser
Ala Thr Ala Ala Pro Ser Arg His Pro Ile Thr Ile Lys
Ala Gly
Asp Trp Gln Glu Phe Arg Glu Lys Leu Thr Phe Tyr Leu
10 Val Thr
Leu Glu Gln Ala Gln Glu Gln Gln [SEQ ID NO:95]; and

Met Ala Asn Cys Ser Ile Met Ile Asp Glu Ile Ile His
His Leu
15 Lys Arg Pro Pro Ala Pro Leu Leu Asp Pro Asn Asn Leu
Asn Ala
Glu Asp Val Asp Ile Leu Met Glu Arg Asn Leu Arg Leu
Pro Asn
Leu Glu Ser Phe Val Arg Ala Val Lys Asn Leu Glu Asn
20 Ala Ser
Gly Ile Glu Ala Ile Leu Arg Asn Leu Val Pro Cys Leu
Pro Ser
Ala Thr Ala Ala Pro Ser Arg His Pro Ile Thr Ile Lys
Ala Gly
25 Asp Trp Gln Glu Phe Arg Glu Lys Leu Thr Phe Tyr Leu
Val Ser
Leu Glu His Ala Gln Glu Gln Gln [SEQ ID NO:96].

30 Met Ala Asn Cys Ser Ile Met Ile Asp Glu Ile Ile His
His Leu
Lys Arg Pro Pro Ala Pro Leu Leu Asp Pro Asn Asn Leu
Asn Ala
35 Glu Asp Val Asp Ile Leu Met Asp Arg Asn Leu Arg Leu
Ser Asn
Leu Glu Ser Phe Val Arg Ala Val Lys Asn Leu Glu Asn
40 Ala Ser

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Gly Ile Glu Ala Ile Leu Arg Asn Leu Gln Pro Cys Leu
Pro Ser

5 Ala Thr Ala Ala Pro Ser Arg His Pro Ile Ile Ile Lys
Ala Gly

Asp Trp Gln Glu Phe Arg Glu Lys Leu Thr Phe Tyr Leu
Val Thr

10 Leu Glu Gln Ala Gln Glu Gln Gln [SEQ ID NO.: 296]

Met Ala Asn Cys Ser Ile Met Ile Asp Glu Ala Ile His
His Leu

15 Lys Arg Pro Pro Ala Pro Ser Leu Asp Pro Asn Asn Leu
Asn Asp

Glu Asp Met Ser Ile Leu Met Glu Arg Asn Leu Arg Leu
20 Pro Asn

Leu Glu Ser Phe Val Arg Ala Val Lys Asn Leu Glu Asn
Ala Ser

25 Gly Ile Glu Ala Ile Leu Arg Asn Leu Gln Pro Cys Leu
Pro Ser

Ala Thr Ala Ala Pro Ser Arg His Pro Ile Ile Ile Lys
Ala Gly

30 Asp Trp Gln Glu Phe Arg Glu Lys Leu Thr Phe Tyr Leu
Val Thr

Leu Glu Gln Ala Gln Glu Gln Gln [SEQ ID NO.: 300]

35 Met Ala Asn Cys Ser Ile Met Ile Asp Glu Ile Ile His
His Leu

40 Lys Arg Pro Pro Ala Pro Leu Leu Asp Pro Asn Asn Leu
Asn Asp

Glu Asp Met Ser Ile Leu Met Glu Arg Asn Leu Arg Leu
45 Pro Asn

Leu Glu Ser Phe Val Arg Ala Val Lys Asn Leu Glu Asn
Ala Ser

50 Gly Ile Glu Ala Ile Leu Arg Asn Leu Gln Pro Cys Leu

349

Pro Ser

Ala Thr Ala Ala Pro Ser Arg His Pro Ile Ile Ile Lys
Ala Gly

5 Asp Trp Gln Glu Phe Arg Glu Lys Leu Thr Phe Tyr Leu
Val Thr

Leu Glu Gln Ala Gln Glu Gln Gln [SEQ ID NO.: 301]

10 Met Ala Asn Cys Ser Ile Met Ile Asp Glu Ile Ile His
His Leu

Lys Arg Pro Pro Ala Pro Leu Leu Asp Pro Asn Asn Leu
15 Asn Ala

Glu Asp Val Asp Ile Leu Met Asp Arg Asn Leu Arg Leu
Pro Asn

20 Leu Glu Ser Phe Val Arg Ala Val Lys Asn Leu Glu Asn
Ala Ser

Gly Ile Glu Ala Ile Leu Arg Asn Leu Gln Pro Cys Leu
Pro Ser

25 Ala Thr Ala Ala Pro Ser Arg His Pro Ile Ile Ile Lys
Ala Gly

Asp Trp Gln Glu Phe Arg Glu Lys Leu Thr Phe Tyr Leu
30 Val Thr

Leu Glu Gln Ala Gln Glu Gln Gln [SEQ ID NO.: 308]

35 Met Ala Asn Cys Ser Ile Met Ile Asp Glu Ile Ile His
His Leu

Lys Arg Pro Pro Ala Pro Leu Leu Asp Pro Asn Asn Leu
Asn Asp

40 Glu Asp Val Ser Ile Leu Met Glu Arg Asn Leu Arg Leu
Pro Asn

Leu Glu Ser Phe Val Arg Ala Val Lys Asn Leu Glu Asn
45 Ala Ser

Gly Ile Glu Ala Ile Leu Arg Asn Leu Gln Pro Cys Leu
Pro Ser

50 Ala Thr Ala Ala Pro Ser Arg His Pro Ile Ile Ile Lys

350

Ala Gly

Asp Trp Gln Glu Phe Arg Glu Lys Leu Thr Phe Tyr Leu
Val Thr

5 Leu Glu Gln Ala Gln Glu Gln Gln [SEQ ID NO.: 309]

Met Ala Asn Cys Ser Ile Met Ile Asp Glu Ile Ile His
10 His Leu

Lys Arg Pro Pro Ala Pro Leu Leu Asp Pro Asn Asn Leu
Asn Asp

15 Glu Asp Met Ser Ile Leu Met Glu Arg Asn Leu Arg Leu
Pro Asn

Leu Glu Ser Phe Val Arg Ala Val Lys Asn Leu Glu Asn
Ala Ser

20 Gly Ile Glu Ala Ile Leu Arg Asn Leu Gln Pro Cys Leu
Pro Ser

Ala Thr Ala Ala Pro Ser Arg His Pro Ile Ile Ile Lys
25 Ala Gly

Asp Trp Gln Glu Phe Arg Glu Lys Leu Thr Phe Tyr Leu
Val Thr

30 Leu Glu Gln Ala Gln Glu Gln Gln [SEQ ID NO.: 310]

Met Ala Tyr Pro Glu Thr Asp Tyr Lys Asp Asp Asp Asp
Lys Asn

35 Cys Ser Ile Met Ile Asp Glu Ile Ile His His Leu Lys
Arg Pro

Pro Ala Pro Leu Leu Asp Pro Asn Asn Leu Asn Ala Glu
Asp Val

40 Asp Ile Leu Met Glu Arg Asn Leu Arg Leu Pro Asn Leu
Glu Ser

Phe Val Arg Ala Val Lys Asn Leu Glu Asn Ala Ser Gly
45 Ile Glu

Ala Ile Leu Arg Asn Leu Gln Pro Cys Leu Pro Ser Ala
Thr Ala

50 Ala Pro Ser Arg His Pro Ile Ile Ile Lys Ala Gly Asp

351

Trp Gln
Glu Phe Arg Glu Lys Leu Thr Phe Tyr Leu Val Thr Leu
Glu Gln
5 Ala Gln Glu Gln Gln [SEQ ID NO.: 315]
Met Ala Tyr Pro Glu Thr Asp Tyr Lys Asp Asp Asp Asp
10 Lys Asn
Cys Ser Ile Met Ile Asp Glu Ile Ile His His Leu Lys
Arg Pro
15 Pro Asn Pro Leu Leu Asp Pro Asn Asn Leu Asn Ser Glu
Asp Met
Asp Ile Leu Met Glu Arg Asn Leu Arg Thr Pro Asn Leu
Leu Ala
20 Phe Val Arg Ala Val Lys His Leu Glu Asn Ala Ser Gly
Ile Glu
Ala Ile Leu Arg Asn Leu Gln Pro Cys Leu Pro Ser Ala
25 Thr Ala
Ala Pro Ser Arg His Pro Ile Ile Ile Lys Ala Gly Asp
Trp Gln
30 Glu Phe Arg Glu Lys Leu Thr Phe Tyr Leu Val Thr Leu
Glu Gln
Ala Gln Glu Gln Gln [SEQ ID NO.: 316]
35 Met Ala Asn Cys Ser Ile Met Ile Asp Glu Leu Ile His
His Leu
Lys Ile Pro Pro Asn Pro Ser Leu Asp Ser Ala Asn Leu
Asn Ser
40 Glu Asp Val Ser Ile Leu Met Glu Arg Asn Leu Arg Thr
Pro Asn
Leu Leu Ala Phe Val Arg Ala Val Lys His Leu Glu Asn
45 Ala Ser
Gly Ile Glu Ala Ile Leu Arg Asn Leu Gln Pro Cys Leu
Pro Ser
50 Ala Thr Ala Ala Pro Ser Arg His Pro Ile Ile Ile Lys

352

Ala Gly

Asp Trp Gln Glu Phe Arg Glu Lys Leu Thr Phe Tyr Leu
Val Thr

5

Leu Glu Gln Ala Gln Glu Gln Gln [SEQ ID NO.: 318]

28. A pharmaceutical composition for the treatment of hematopoietic cell deficiencies comprising a therapeutically effective amount of a mutant human interleukin-3 polypeptide selected from the group consisting of a polypeptide of claim 1, a polypeptide of claim 2, a polypeptide of claim 3, a polypeptide of claim 4, a polypeptide of claim 5, a polypeptide of claim 6, a polypeptide of claim 7, a polypeptide of claim 8, a polypeptide of claim 9, a polypeptide of claim 10, a polypeptide of claim 11, a polypeptide of claim 12, a polypeptide of claim 13, a polypeptide of claim 14, a polypeptide of claim 15, a polypeptide of claim 16, a polypeptide of claim 17; a polypeptide of claim 18, a polypeptide of claim 19, a polypeptide of claim 20, a polypeptide of claim 21, a polypeptide of claim 22, a polypeptide of claim 23, a polypeptide of claim 24, a polypeptide of claim 25, a polypeptide of claim 26 and a polypeptide of claim 27, and a pharmaceutically acceptable carrier.

29. A pharmaceutical composition according to Claim 28 for the treatment of hematopoietic cell deficiencies comprising a therapeutically effective amount of a polypeptide having an amino acid sequence corresponding to SEQ ID NO:88 and a pharmaceutically acceptable carrier.

35

30. A pharmaceutical composition according to Claim 28 for the treatment of hematopoietic cell deficiencies comprising a therapeutically effective

amount of a polypeptide having an amino acid sequence corresponding to SEQ ID NO:89 and a pharmaceutically acceptable carrier.

5 31. A pharmaceutical composition according to Claim 28 for the treatment of hematopoietic cell deficiencies comprising a therapeutically effective amount of a polypeptide having an amino acid sequence corresponding to SEQ ID NO:90 and a pharmaceutically
10 acceptable carrier.

 32. A pharmaceutical composition according to Claim 28 for the treatment of hematopoietic cell deficiencies comprising a therapeutically effective
15 amount of a polypeptide selected from the group consisting of

 a polypeptide having an amino acid sequence corresponding to SEQ ID NO:66;
20

 a polypeptide having an amino acid sequence corresponding to SEQ ID NO:67;

 a polypeptide having an amino acid sequence corresponding to SEQ ID NO:68;
25

 a polypeptide having an amino acid sequence corresponding to SEQ ID NO:69;

 a polypeptide having an amino acid sequence corresponding to SEQ ID NO:70;
30

 a polypeptide having an amino acid sequence corresponding to SEQ ID NO:71;
35

 a polypeptide having an amino acid sequence corresponding

354

to SEQ ID NO:72;

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:73;

5

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:74;

10

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:75;

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:76;

15

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:77;

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:78;

20

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:79;

25

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:80;

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:81;

30

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:82;

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:83;

35

a polypeptide having an amino acid sequence corresponding

355

to SEQ ID NO:84;

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:85;

5

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:86;

10

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:87;

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:91;

15

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:92;

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:93;

20

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:94;

25

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:95;

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:96;

30

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:258;

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:259;

35

a polypeptide having an amino acid sequence corresponding

356

to SEQ ID NO:260;

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:261;

5

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:262;

10

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:263;

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:278;

15

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:279;

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:314;

20

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:315;

25

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:316;

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:264;

30

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:265;

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:266;

35

a polypeptide having an amino acid sequence corresponding

357

to SEQ ID NO:267;

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:268;

5

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:269;

10

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:270;

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:271;

15

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:272;

20

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:273;

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:274;

25

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:275;

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:276;

30

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:277;

35

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:280;

358

- a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:281;
- 5 a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:282;
- a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:283;
- 10 a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:284;
- a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:285;
- 15 a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:286;
- 20 a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:287;
- a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:288;
- 25 a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:289;
- a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:290;
- 30 a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:300;
- 35 a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:301;

359

- a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:302;
- 5 a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:303;
- a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:304;
- 10 a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:305;
- a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:306;
- 15 a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:307;
- 20 a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:308;
- a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:309;
- 25 a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:310;
- a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:311;
- 30 a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:312;
- 35 a polypeptide having an amino acid sequence corresponding

360

to SEQ ID NO:313;

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:314;

5

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:317;

10

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:318;

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:319;

15

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:320;

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:321;

20

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:322;

25

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:323;

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:324;

30

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:325;

35

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:326;

and a pharmaceutically acceptable carrier.

33. A method of stimulating the production of hematopoietic cells which comprises administering a therapeutically effective amount of a mutant human interleukin-3 polypeptide selected from the group consisting of a polypeptide of claim 1, a polypeptide of claim 2, a polypeptide of claim 3, a polypeptide of claim 4, a polypeptide of claim 5, a polypeptide of claim 6, a polypeptide of claim 7, a polypeptide of claim 8, a polypeptide of claim 9, a polypeptide of claim 10, a polypeptide of claim 11, a polypeptide of claim 12, a polypeptide of claim 13, a polypeptide of claim 14, a polypeptide of claim 15, a polypeptide of claim 16, a polypeptide of claim 17; a polypeptide of claim 18, a polypeptide of claim 19, a polypeptide of claim 20, a polypeptide of claim 21, a polypeptide of claim 22, a polypeptide of claim 23, a polypeptide of claim 24, a polypeptide of claim 25, a polypeptide of claim 26, a polypeptide of claim 27, to a patient in need of such treatment.

20

34. A method according to claim 33 of stimulating the production of hematopoietic cells which comprises administering a therapeutically effective amount of a polypeptide having an amino acid sequence corresponding to SEQ ID NO:88.

25

35. A method according to claim 33 of stimulating the production of hematopoietic cells which comprises administering a therapeutically effective amount of a polypeptide having an amino acid sequence corresponding to SEQ ID NO:89.

30

36. A method according to claim 33 of stimulating the production of hematopoietic cells which comprises administering a therapeutically effective amount of a polypeptide having an amino acid

35

362

sequence corresponding to SEQ ID NO:90.

37. A method according to claim 33 of
stimulating the production of hematopoietic cells
5 which comprises administering a therapeutically
effective amount of a polypeptide selected from the
group consisting of

10 a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:66;

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:67;

15 a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:68;

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:69;

20 a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:70;

25 a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:71;

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:72;

30 a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:73;

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:74;

35 a polypeptide having an amino acid sequence corresponding

363

to SEQ ID NO:75;

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:76;

5

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:77;

10

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:78;

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:79;

15

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:80;

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:81;

20

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:82;

25

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:83;

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:84;

30

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:85;

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:86;

35

a polypeptide having an amino acid sequence corresponding

364

to SEQ ID NO:87;

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:91;

5

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:92;

10

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:93;

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:94;

15

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:95;

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:96;

20

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:258;

25

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:259;

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:260;

30

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:261;

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:262;

35

a polypeptide having an amino acid sequence corresponding

365

to SEQ ID NO:263;

5

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:278;

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:279;

10

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:314;

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:315;

15

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:316;

20

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:264;

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:265;

25

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:266;

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:267;

30

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:268;

35

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:269;

366

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:270;

5 a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:271;

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:272;

10 a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:273;

15 a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:274;

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:275;

20 a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:276;

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:277;

25 a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:280;

30 a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:281;

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:282;

35 a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:283;

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:284;

5

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:285;

10

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:286;

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:287;

15

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:288;

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:289;

20

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:299;

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:300;

25

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:301;

30

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:302;

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:303;

35

a polypeptide having an amino acid sequence corresponding

368

to SEQ ID NO:304;

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:305;

5

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:306;

10

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:307;

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:308;

15

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:309;

20

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:310;

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:311;

25

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:312;

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:313;

30

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:314;

35

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:317;

369

a polypeptide having an amino acid sequence corresponding to SEQ ID NO:318;

5 a polypeptide having an amino acid sequence corresponding to SEQ ID NO:319;

10 a polypeptide having an amino acid sequence corresponding to SEQ ID NO:320;

a polypeptide having an amino acid sequence corresponding to SEQ ID NO:321;

15 a polypeptide having an amino acid sequence corresponding to SEQ ID NO:322;

a polypeptide having an amino acid sequence corresponding to SEQ ID NO:323;

20 a polypeptide having an amino acid sequence corresponding to SEQ ID NO:324;

25 a polypeptide having an amino acid sequence corresponding to SEQ ID NO:325;

a polypeptide having an amino acid sequence corresponding to SEQ ID NO:326;

30 to a patient in need of such treatment.

35 38. A recombinant DNA sequence comprising vector DNA and a DNA that encodes a polypeptide selected from the group consisting of a polypeptide of claim 1, a polypeptide of claim 2, a polypeptide of claim 3, a polypeptide of claim 4, a polypeptide of claim 5, a polypeptide of claim 6, a polypeptide of claim 7, a polypeptide of claim 8, a polypeptide

of claim 9, a polypeptide of claim 10, a polypeptide of claim 11,
a polypeptide of claim 12, a polypeptide of claim 13, a
polypeptide of claim 14, a polypeptide of claim 15, a polypeptide
of claim 16, a polypeptide of claim 17; a polypeptide of claim
5 18, a polypeptide of claim 19, a polypeptide of claim 20, a
polypeptide of claim 21, a polypeptide of claim 22, a polypeptide
of claim 23, a polypeptide of claim 24, a polypeptide of claim
25, a polypeptide of claim 26, or a polypeptide of claim 27,.

10 39. A recombinant DNA sequence according to
Claim 38 comprising vector DNA and a DNA having a
nucleotide sequence corresponding to SEQ ID NO:97.

15 40. A recombinant DNA sequence according to
Claim 38 comprising vector DNA and a DNA having a
nucleotide sequence corresponding to SEQ ID NO:100 or
103.

20 41. A recombinant DNA sequence according to
Claim 38 comprising vector DNA and a DNA having a
nucleotide sequence corresponding to SEQ ID NO:161.

25 42. A recombinant DNA sequence according to
Claim 38 comprising vector DNA and a DNA selected from

a DNA having a nucleotide sequence corresponding to SEQ ID
NO:98;

30 a DNA having a nucleotide sequence corresponding to SEQ ID
NO:99;

a DNA having a nucleotide sequence corresponding to SEQ ID
NO:101;

35 a DNA having a nucleotide sequence corresponding to SEQ ID
NO:102;

371

- a DNA having a nucleotide sequence corresponding to SEQ ID
NO:104;
- 5 a DNA having a nucleotide sequence corresponding to SEQ ID
NO:105;
- a DNA having a nucleotide sequence corresponding to SEQ ID
NO:106;
- 10 a DNA having a nucleotide sequence corresponding to SEQ ID
NO:107;
- 15 a DNA having a nucleotide sequence corresponding to SEQ ID
NO:108;
- a DNA having a nucleotide sequence corresponding to SEQ ID
NO:109;
- 20 a DNA having a nucleotide sequence corresponding to SEQ ID
NO:110;
- a DNA having a nucleotide sequence corresponding to SEQ ID
NO:111;
- 25 a DNA having a nucleotide sequence corresponding to SEQ ID
NO:112;
- a DNA having a nucleotide sequence corresponding to SEQ ID
NO:113;
- 30 a DNA having a nucleotide sequence corresponding to SEQ ID
NO:114;
- 35 a DNA having a nucleotide sequence corresponding to SEQ ID

372

NO:115;

a DNA having a nucleotide sequence corresponding to SEQ ID

NO:116;

5

a DNA having a nucleotide sequence corresponding to SEQ ID

NO:117;

10

a DNA having a nucleotide sequence corresponding to SEQ ID

NO:118;

15

a DNA having a nucleotide sequence corresponding to SEQ ID

NO:119;

a DNA having a nucleotide sequence corresponding to SEQ ID

NO:120;

20

a DNA having a nucleotide sequence corresponding to SEQ ID

NO:121;

a DNA having a nucleotide sequence corresponding to SEQ ID

NO:122;

25

a DNA having a nucleotide sequence corresponding to SEQ ID

NO:123;

a DNA having a nucleotide sequence corresponding to SEQ ID

NO:124;

30

a DNA having a nucleotide sequence corresponding to SEQ ID

NO:125;

35

a DNA having a nucleotide sequence corresponding to SEQ ID

NO:126;

373

a DNA having a nucleotide sequence corresponding to SEQ ID
NO:127;

5

a DNA having a nucleotide sequence corresponding to SEQ ID
NO:160;

a DNA having a nucleotide sequence corresponding to SEQ ID
NO:161;

10

a DNA having a nucleotide sequence corresponding to SEQ ID
NO:398;

15

a DNA having a nucleotide sequence corresponding to SEQ ID
NO:399;

a DNA having a nucleotide sequence corresponding to SEQ ID
NO:346;

20

a DNA having a nucleotide sequence corresponding to SEQ ID
NO:347

a DNA having a nucleotide sequence corresponding to SEQ ID
NO:303

25

a DNA having a nucleotide sequence corresponding to SEQ ID
NO:404

30

a DNA having a nucleotide sequence corresponding to SEQ ID
NO:405

a DNA having a nucleotide sequence corresponding to SEQ ID
NO:332

35

a DNA having a nucleotide sequence corresponding to SEQ ID
NO:333

374

- a DNA having a nucleotide sequence corresponding to SEQ ID
NO:334
- 5 a DNA having a nucleotide sequence corresponding to SEQ ID
NO:335
- a DNA having a nucleotide sequence corresponding to SEQ ID
NO:336
- 10 a DNA having a nucleotide sequence corresponding to SEQ ID
NO:337
- 15 a DNA having a nucleotide sequence corresponding to SEQ ID
NO:338
- a DNA having a nucleotide sequence corresponding to SEQ ID
NO:339
- 20 a DNA having a nucleotide sequence corresponding to SEQ ID
NO:340
- a DNA having a nucleotide sequence corresponding to SEQ ID
NO:341
- 25 a DNA having a nucleotide sequence corresponding to SEQ ID
NO:342
- a DNA having a nucleotide sequence corresponding to SEQ ID
NO:343
- 30 a DNA having a nucleotide sequence corresponding to SEQ ID
NO:344
- 35 a DNA having a nucleotide sequence corresponding to SEQ ID

375

NO:345

a DNA having a nucleotide sequence corresponding to SEQ ID

NO:348

5

a DNA having a nucleotide sequence corresponding to SEQ ID

NO:349

a DNA having a nucleotide sequence corresponding to SEQ ID

10

NO:350

a DNA having a nucleotide sequence corresponding to SEQ ID

NO:352

15

a DNA having a nucleotide sequence corresponding to SEQ ID

NO:353

a DNA having a nucleotide sequence corresponding to SEQ ID

20

NO:354

a DNA having a nucleotide sequence corresponding to SEQ ID

NO:355

25

a DNA having a nucleotide sequence corresponding to SEQ ID

NO:356

a DNA having a nucleotide sequence corresponding to SEQ ID

NO:357

30

a DNA having a nucleotide sequence corresponding to SEQ ID

NO:358

a DNA having a nucleotide sequence corresponding to SEQ ID

35

NO:359

376

- a DNA having a nucleotide sequence corresponding to SEQ ID
NO:360
- 5 a DNA having a nucleotide sequence corresponding to SEQ ID
NO:361
- a DNA having a nucleotide sequence corresponding to SEQ ID
NO:362
- 10 a DNA having a nucleotide sequence corresponding to SEQ ID
NO:363
- a DNA having a nucleotide sequence corresponding to SEQ ID
NO:364
- 15 a DNA having a nucleotide sequence corresponding to SEQ ID
NO:365
- 20 a DNA having a nucleotide sequence corresponding to SEQ ID
NO:366
- a DNA having a nucleotide sequence corresponding to SEQ ID
NO:367
- 25 a DNA having a nucleotide sequence corresponding to SEQ ID
NO:368
- a DNA having a nucleotide sequence corresponding to SEQ ID
NO:369
- 30 a DNA having a nucleotide sequence corresponding to SEQ ID
NO:370
- 35 a DNA having a nucleotide sequence corresponding to SEQ ID
NO:371

377

- a DNA having a nucleotide sequence corresponding to SEQ ID
NO:372
- 5 a DNA having a nucleotide sequence corresponding to SEQ ID
NO:373
- a DNA having a nucleotide sequence corresponding to SEQ ID
NO:374
- 10 a DNA having a nucleotide sequence corresponding to SEQ ID
NO:375
- a DNA having a nucleotide sequence corresponding to SEQ ID
15 NO:376
- a DNA having a nucleotide sequence corresponding to SEQ ID
NO:377
- 20 a DNA having a nucleotide sequence corresponding to SEQ ID
NO:378
- a DNA having a nucleotide sequence corresponding to SEQ ID
25 NO:379
- a DNA having a nucleotide sequence corresponding to SEQ ID
NO:380
- 30 a DNA having a nucleotide sequence corresponding to SEQ ID
NO:381
- a DNA having a nucleotide sequence corresponding to SEQ ID
NO:382
- 35 a DNA having a nucleotide sequence corresponding to SEQ ID

378

NO:384

a DNA having a nucleotide sequence corresponding to SEQ ID

NO:385

5

a DNA having a nucleotide sequence corresponding to SEQ ID

NO:386

a DNA having a nucleotide sequence corresponding to SEQ ID

10

NO:387

a DNA having a nucleotide sequence corresponding to SEQ ID

NO:388

15

a DNA having a nucleotide sequence corresponding to SEQ ID

NO:389

a DNA having a nucleotide sequence corresponding to SEQ ID

20

NO:390

a DNA having a nucleotide sequence corresponding to SEQ ID

NO:391

25

a DNA having a nucleotide sequence corresponding to SEQ ID

NO:392

43. A host cell containing a recombinant
30 DNA sequence of claim 38 and capable of expressing the
encoded polypeptide.

44. A host cell of claim 43 containing a
recombinant DNA vector comprising vector DNA and a DNA
35 having a nucleotide sequence corresponding to SEQ ID
NO:97 and capable of expressing the encoded

polypeptide.

45. A host cell of claim 43 containing a recombinant DNA vector comprising vector DNA and a DNA
5 having a nucleotide sequence corresponding to SEQ ID NO:100 or 103 and capable of expressing the encoded polypeptide.

46. A host cell of claim 43 containing a recombinant DNA vector comprising vector DNA and a DNA
10 having a nucleotide sequence corresponding to SEQ ID NO:161 and capable of expressing the encoded polypeptide.

15 47. A method of producing a mutant human interleukin-3 polypeptide comprising the steps of:

(a) culturing a host cell containing a recombinant DNA sequence comprising vector DNA
20 and a DNA sequence of Claim 38 and capable of expressing the encoded polypeptide under conditions permitting expression of the recombinant DNA; and

25 (b) harvesting the polypeptide from the culture.

48. A method according to Claim 47 of producing a mutant human interleukin-3 polypeptide comprising the steps of:

30 (a) culturing a host cell containing a recombinant DNA sequence comprising vector DNA and a DNA having a nucleotide sequence corresponding to SEQ ID NO:97 and capable of
35 expressing the encoded polypeptide under conditions permitting expression of the

recombinant DNA; and

(b) harvesting the polypeptide from the culture.

5 49. A method according to Claim 47 of
producing a mutant human interleukin-3 polypeptide
comprising the steps of:

10 (a) culturing a host cell containing a
recombinant DNA sequence comprising vector DNA
and a DNA having a nucleotide sequence
corresponding to SEQ ID NO:100 or 103 and capable
of expressing the encoded polypeptide under
conditions permitting expression of the
15 recombinant DNA; and

(b) harvesting the polypeptide from the culture.

20 50. A method according to Claim 47 of
producing a mutant human interleukin-3 polypeptide
comprising the steps of:

25 (a) culturing a host cell containing a
recombinant DNA sequence comprising vector DNA
and a DNA having a nucleotide sequence
corresponding to SEQ ID NO:161 and capable of
expressing the encoded polypeptide under
conditions permitting expression of the
recombinant DNA; and

30 (b) harvesting the polypeptide from the culture.

35 51. A vector containing a gene having a DNA
sequence selected from the group consisting of:

a DNA having a nucleotide sequence corresponding

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to SEQ ID NO:97;

a DNA having a nucleotide sequence corresponding
to SEQ ID NO:100;

5

a DNA having a nucleotide sequence corresponding
to SEQ ID NO:103;

10

a DNA having a nucleotide sequence corresponding
to SEQ ID NO:160;

a DNA having a nucleotide sequence corresponding
to SEQ ID NO:161;

15

a DNA having a nucleotide sequence corresponding
to SEQ ID NO:404;

20

a DNA having a nucleotide sequence corresponding
to SEQ ID NO:405;

a DNA having a nucleotide sequence corresponding
to SEQ ID NO:364;

25

a DNA having a nucleotide sequence corresponding
to SEQ ID NO:368;

30

a DNA having a nucleotide sequence corresponding
to SEQ ID NO:369;

a DNA having a nucleotide sequence corresponding
to SEQ ID NO:376;

35

a DNA having a nucleotide sequence corresponding
to SEQ ID NO:377;

a DNA having a nucleotide sequence corresponding to SEQ ID NO:378;

5

a DNA having a nucleotide sequence corresponding to SEQ ID NO:385;

52. A recombinant DNA vector comprising a promoter, a ribosome binding site, and a signal peptide directly linked to a DNA sequence encoding a polypeptide selected from the group consisting of

15 a polypeptide having an amino acid sequence corresponding to SEQ ID NO:88;

a polypeptide having an amino acid sequence corresponding to SEQ ID NO:89; and

20 a polypeptide having an amino acid sequence corresponding to SEQ ID NO:90;

25 said vector being capable of directing expression of said mutant human interleukin-3 polypeptide.

53. A recombinant DNA vector according to Claim 51 wherein the promoter is AraBAD.

30 54. A recombinant DNA vector according to Claim 51 wherein the ribosome binding site is g10-L.

55. A recombinant DNA vector according to Claim 51 wherein the signal peptide is a lamB signal peptide.

35

56. A recombinant DNA vector according to

Claim 51 wherein the signal peptide is the lamB signal peptide depicted in Figure 8.

5 57. A recombinant DNA vector according to Claim 51 wherein the promoter is AraBAD and the ribosome binding site is gl0-L.

10 58. A recombinant DNA vector according to Claim 51 wherein the promoter is AraBAD, the ribosome binding site is gl0-L, and the signal peptide is a lamB signal peptide.

15 59. A recombinant DNA vector according to Claim 51 wherein the promoter is AraBAD, the ribosome binding site is gl0-L, and the signal peptide is the lamB signal peptide depicted in Figure 8.

20 60. A recombinant bacterial host which comprises the vector of Claim 51 wherein said host secretes a mutant human interleukin-3 polypeptide selected from the group consisting of

25 a polypeptide having an amino acid sequence corresponding to SEQ ID NO:88;

 a polypeptide having an amino acid sequence corresponding to SEQ ID NO:89; and

30 a polypeptide having an amino acid sequence corresponding to SEQ ID NO:90.

 61. A polypeptide of the formula

 1 5 10
(Met)_m-Ala Pro Met Thr Gln Thr Thr Ser Leu Lys Thr

35

15

20

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Ser Trp Val Asn Cys Ser Xaa Met Ile Asp Glu Ile Ile
 25 30 35
 Xaa His Leu Lys Xaa Pro Pro Xaa Pro Leu Leu Asp Xaa
 40 45 50
 5 Asn Asn Leu Asn Xaa Glu Asp Xaa Asp Ile Leu Met Glu
 55 60
 Xaa Asn Leu Arg Xaa Pro Asn Leu Xaa Xaa Phe Xaa Arg
 65 70 75
 Ala Val Lys Xaa Leu Xaa Asn Ala Ser Xaa Ile Glu Xaa
 10 80 85
 Ile Leu Xaa Asn Leu Xaa Pro Cys Leu Pro Xaa Ala Thr
 90 95 100
 Ala Ala Pro Xaa Arg His Pro Ile Xaa Ile Lys Xaa Gly
 105 110 115
 15 Asp Trp Xaa Glu Phe Arg Xaa Lys Leu Thr Phe Tyr Leu
 120 125
 Xaa Thr Leu Glu Xaa Ala Gln Xaa Gln Gln Thr Thr Leu
 130
 Ser Leu Ala Ile Phe [SEQ ID NO:129]

20

wherein m is 0 or 1; Xaa at position 18 is Asn or Ile;
 Xaa at position 25 is Thr or His; Xaa at position 29
 is Gln, Arg, or Val; Xaa at position 32 is Leu, Ala,
 or Asn; Xaa at position 37 is Phe, Pro, or Ser; Xaa at
 25 position 42 is Glu, Ala, or Ser; Xaa at position 45 is
 Gln, Val, or Met; Xaa at position 51 is Asn or Arg;
 Xaa at position 55 is Arg, Leu, or Thr; Xaa at
 position 59 is Glu or Leu; Xaa at position 60 is Ala
 or Ser; Xaa at position 62 is Asn or Val; Xaa at
 30 position 67 is Ser, Asn, or His; Xaa at position 69 is
 Gln or Glu; Xaa at position 73 is Ala or Gly; Xaa at
 position 76 is Ser or Ala; Xaa at position 79 is Lys
 or Arg; Xaa at position 82 is Leu, Glu, or Val; Xaa at
 position 87 is Leu or Ser; Xaa at position 93 is Pro
 35 or Ser; Xaa at position 98 is His, Ile, or Thr; Xaa at
 position 101 is Asp or Ala; Xaa at position 105 is Asn

or Glu; Xaa at position 109 is Arg or Glu; Xaa at position 116 is Lys or Val; Xaa at position 120 is Asn, Gln, or His; Xaa at position 123 is Ala or Glu; with the proviso that from four to twenty-seven of the amino acids designated by Xaa are different from the corresponding amino acids of native human interleukin-3 and wherein from 1 to 14 of amino acids 1 to 14 has been deleted from the N-terminus and/or from 1 to 15 of amino acids 119 to 133 has been deleted from the C-terminus of the polypeptide; or a polypeptide having substantially the same structure and substantially the same biological activity.

62. A method according to Claim 47 of producing a mutant human interleukin-3 polypeptide comprising the steps of:

- (a) culturing a host cell containing a recombinant DNA sequence comprising vector DNA and a DNA having a nucleotide sequence corresponding to SEQ ID NO:160 and capable of expressing the encoded polypeptide under conditions permitting expression of the recombinant DNA; and
- (b) harvesting the polypeptide from the culture.

63. A method according to Claim 47 of producing a mutant human interleukin-3 polypeptide comprising the steps of:

- (a) culturing a host cell containing a recombinant DNA sequence comprising vector DNA and a DNA having a nucleotide sequence corresponding to SEQ ID NO:161 and capable of expressing the encoded polypeptide under

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conditions permitting expression of the recombinant DNA; and

(b) harvesting the polypeptide from the culture.

5

64. A host cell containing a recombinant DNA vector comprising vector DNA and a DNA sequence selected from the group consisting of:

10 a DNA having a nucleotide sequence corresponding to SEQ ID NO:160; and

a DNA having a nucleotide sequence corresponding to SEQ ID NO:161;

15

and capable of expressing the encoded polypeptide.

65. A polypeptide according to Claim 27 which is:

20 Met Ala Asn Cys Ser Ile Met Ile Asp Glu Ile Ile His His Leu

Lys Arg Pro Pro Asn Pro Leu Leu Asp Pro Asn Asn Leu Asn Ser

Glu Asp Met Asp Ile Leu Met Glu Arg Asn Leu Arg Thr

25 Pro Asn

Leu Leu Ala Phe Val Arg Ala Val Lys His Leu Glu Asn Ala Ser

Gly Ile Glu Ala Ile Leu Arg Asn Leu Gln Pro Cys Leu Pro Ser

30 Ala Thr Ala Ala Pro Ser Arg His Pro Ile Ile Ile Lys Ala Gly

Asp Trp Gln Glu Phe Arg Glu Lys Leu Thr Phe Tyr Leu Val Thr

Leu Glu Gln Ala Gln Glu Gln Gln [SEQ ID NO:89].

35

INTERLEUKIN-3 (IL-3) MULTIPLE MUTATION POLYPEPTIDES